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Cincinnati Univ, Ohio Southwestern Ohio Regional Computer Ctr

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Model State Information System
Training Program

Volume I

Instructor's Handbook

for

MSIS OVERVIEW

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Washington, D.C. 20460
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This Instructor's Handbook is one of six prepared for the U.S. Environmental Protection Agency's Office of Drinking Water by the Southwestern Ohio Regional Computer Center (SWORCC). Its purpose is to help instructors teach State and EPA personnel about the Model State Information System (MSIS). Specific information is presented on: The course, units comprising the course, content of each unit, Instructor preparation, recommended presentation, and Evaluation.

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Ellen G. Miller
Project Manager, OWS-77-01

INTRODUCTION

This Instructor's Handbook is one of six prepared for the U.S. Environmental Protection Agency's Office of Water Supply by the SouthWestern Ohio Regional Computer Center (SWORCC). Its purpose is to help instructors teach State and EPA personnel about the Model State Information System (MSIS). Specific information is presented on:

- The course
- Units comprising the course
- Content of each unit
- Instructor preparation
- Recommended presentation
- Evaluation

The handbook was designed with the expectation that two uses will be made of it: 1) During on-site visits to States by the SWORCC training team, and 2) by State personnel during subsequent training within the State. Although it is felt that both content and suggested sequence of material contained herein will be optimum for most trainees, it is realized that State training needs will vary. This handbook was assembled in loose-leaf format, and the course itself was designed to be flexible. Both flexible physical format and organization will be helpful to those States that use the handbook for future training of State personnel.

The handbook has four parts: Design Criteria, Team Procedures, Course Content, and Course Reference Material. Part III, Course Content, contains the real heart of the handbook and takes a formal approach to training. It will be noted that specific goals and behavorial objectives are listed for each training unit together with self-measurement techniques and recommended achievement levels. Pre- and post- tests are used to evaluate the degree to which participants attain course goals and behavioral objectives.

Since trainees will be furnished a Participant's Handbook, the instructor should become familiar with its contents. It is intended that all trainees will use their own copy of the appropriate Participant's Handbook throughout the course, and will retain it for future reference. It is assumed that trainees will learn the most about MSIS if they take all the courses offered. However, each course was designed as a free-standing, complete entity to accommodate partial attendance by trainees.

One last introductory comment. Part I of this handbook, Design Criteria, tells how the MSIS training program evolved, but also discusses the criteria used to design the program -

assumptions, needs assessment, limiting parameters, teaching methods, and training philosophy. Familiarity with this background will increase overall understanding of this handbook and of the entire MSIS Training Program.

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MODEL STATE INFORMATION SYSTEM

PART I

DESIGN CRITERIA

MSIS

INTRODUCTION

The purpose of this portion of the handbook is to convey to the user information which, though not directly concerned with course content, will aid in achieving a fuller understanding of the entire MSIS Training Program. The MSIS Training Program consists of six courses. They are:

- MSIS Overview
- MSIS Subsystems
- Data Entry
- Selection Process
- MSIS Components
- System Specifications

BACKGROUND:

The responsibility for implementing the Safe Drinking Water Act of 1974 was delegated to the Office of Water Supply (OWS) of the U.S. Environmental Protection Agency (EPA). In order to provide the States and EPA Regions with the capability to fulfill their basic responsibilities for monitoring water quality, as required by the Safe Drinking Water Act, OWS entered into a series of contracts.

The first series, with American Management Systems, Inc. (AMS) of Arlington, Virginia, resulted in both the concept of an informational system and its computerized version (the Model State Information System).

The second series of contracts was with the SouthWestern Ohio Regional Computer Center (SWORCC) of Cincinnati, Ohio. One major contract was to perform the detailed systems design, programming, testing and documentation of the computerized Model State Information System (GSA Contract No. GS-05S-10458, Task Assignment No. OWS-76-02).

Installation Plan - Phase 1, the other major contract, was identified as Task Assignment No. OWS-77-01, under the GSA Contract. The dual purposes of that task were as follows:

- Assist the EPA Regions in ascertaining the needs of the States and Regions for aid while installing the MSIS.

- Develop training packages based on Regional recommendations.

The MSIS Training Program is a direct result of this latter contract.

TRAINING PHILOSOPHY:

The SWORCC training philosophy can be stated briefly as follows: Every training program should contain five distinct phases - goal setting, needs assessment, activity planning, activity conducting and evaluation. Subsequent paragraphs will relate each of these program phases to the MSIS Training Program.

Goal Setting: The need for goals is obvious and most programs have them. Usually, however, they are stated in vague terms; as a consequence, progress toward obtaining them may be difficult to measure. In this instance the broad goal was established when the Office of Water Supply directed SWORCC to develop a training program for the MSIS. Within the training program, a specific goal has been listed for each course, and for each unit within a course.

Needs Assessment: The needs assessment phase is absolutely necessary to focus the training effort. First, it is here that information is gathered on the current training level of the population to be trained. Second, if properly designed, it gives that same population some input into decision-making on the program itself as to kind, amount and length of training. Therefore the program can be designed more nearly to suit not only the needs but also the desires of those to be trained. The resulting motivation on the part of the trainees is of subsequent benefit in enhancing transfer of training from the training environment to the job setting.

For MSIS, the needs assessment phase was accomplished through the use of Background Information Packages (BIP's) which were distributed to all States through the ten EPA Regional Offices. The information from the BIP's was used in making decisions on the type, amount, and length of training.

Activity Planning: The educational research literature was drawn upon heavily during activity planning. The finding by Dubin and Taveggia that all teaching methods are equivalent gave complete freedom to choose a variety of instructional techniques to maintain both trainer and trainee interest. Knowles' discussion of adults and the learning environment was felt to be especially applicable to the training environment. First, he observes that an adult perceives himself to be wholly self-directed and tends to resist learning under conditions that are incongruent with this self-concept of autonomous individuality. Because of this, the learning climate should be one in which adults feel at ease and the psychological climate should be one of respect, acceptance, and support; the evaluation of learning should be free of value judgment and should focus on self-evaluation and a measurement of progress toward a goal.

Second, Knowles points out that adults, by definition, have a large volume of varied experiences available to them and that if these experiences are not used or are minimized, the adult feels rejected as a person. Here the implications point toward group discussion and practical application of the learning experience. Finally, Knowles tells us that adults have a perspective of immediacy of application of learning - a problem-centered frame of mind - and suggests that all adult learning experiences should commence by a sharing of common problems.

We concur with these research findings; they are reflected in our requirements for an adult learning environment (a large comfortable room, movable chairs, newsprint rather than blackboards, coffee, self-evaluation, etc.); recognition of valuable previous experience of trainees (small group discussion, large group discussion); and allowance for immediate application of learning (simulation, problem solving, and hands-on practice).

Activity Conducting: The activity conducting phase of a training program, though certainly always present, does seem to have been the key to the past failure of many otherwise excellent technical training programs. Mannion expressed this quite clearly during a visit to SWORCC in December, 1976. He felt that the U.S. government has had good success in the past with the development of sound technical programs, but that the failure of such programs had often been in the implementation phase. He attributed this failure to poor instructor training and poor transfer of training from the training environment to the job setting. SWORCC has strived to reduce both problems in the design of the MSIS Training Program.

The problem of instructor training was attacked directly by having the University of Cincinnati's Faculty Resource Center (FRC) conduct the necessary training. Grasha's approach to MSIS instructor training was similar to that previously found useful by the FRC with faculty at the University of Cincinnati. Essentially, a team approach was applied whereby practice sessions were held using actual MSIS training literature. Observations (audio or visual, as appropriate), were made and feedback sessions were held.

The teams formed were basically the same teams that conducted training in the field and, when possible, the FRC staff member spent 1-2 days on-location with the team during early State visits. Keeping the same persons assigned to one teaching team facilitates formulative evaluation, which is the ongoing improvement of the training program due to student feedback and trainer perceptions. Using an FRC teaching expert to help the team during its on-site visit also aids in formulative evaluation.

Goldstein speaks directly to the problem of transfer of training and lists two areas as being especially pertinent: Trainee motivation, and the similarity of training and the job environment. The SWORCC design has focused on trainee motivation during MSIS instructor training, as well as during on-site training. Knowles' comparison of pedagogy (teaching of children) with andragogy (teaching of adults) was used when designing maximally motivating content and teaching methods. Extrinsic motivations by instructors in the form of praise, encouragement, etc., was incorporated into the instructor training. The "hands-on" technique of training employed to input data to the computer employs Knowles' concept of problem-centered training and Goldstein's recommendation for similarity of job and training environment.

Evaluation: The last item in the SWORCC training philosophy, and perhaps the most troublesome, is evaluation. The training literature is of little help here since, as Goldstein points out, very few training programs are evaluated at all. Those discussions which do appear in the literature seem to concentrate on the training environment and techniques used there with little attempt to relate these techniques to job performance. The MSIS Training Program uses a simple three step evaluation process: Pre-test and post-test on the training material, and continuous evaluation of the learning process.

Some specific methods of continuous evaluation are: daily, written feedback from trainees; daily process or evaluation by the training team; use of an observor on the training team; and debriefing of the training team by the project managers.

INTENDED USE:

Perhaps the best way to convey intended use of the MSIS Training Program is simply to list the more important assumptions made. For convenience, they are listed under Trainee, Trainer, and General:

Trainee Assumptions:

1. Each trainee will not necessarily attend all MSIS training courses offered.
2. Each trainee will have a participant handbook available to him/her during the training period.
3. The number of trainees will be between five (5) and thirty (30).
4. Those attending training sessions will not know each other.

5. Persons selected to attend are responsible professionals concerned with satisfaction of problem-oriented needs.
6. Trainees will (generally) be expected to act as instructors to train other personnel in their area.
7. Trainees will need a brief data processing orientation which defines DP terminology, etc.
8. Trainees must be provided the general context of MSIS (the Safe Drinking Water Act, Regulations, etc.).
9. Those successfully completing the training (Unit, Course, MSIS Training Program) will be able to confidently apply the skills gained when returning to the job environment.

Trainer Assumptions:

1. A minimum of two trainers is available for each training session.
2. Trainers are fully qualified in both course content about and functions of MSIS.
3. Trainers are fully cognizant of and qualified in instructional techniques required to obtain a maximally effective training environment.
4. Trainers practice observation/feedback techniques to insure continuous improvement of the training process.

General Assumptions:

1. Any course, and any unit of any course within the entire MSIS Training Program, can be conducted independently with appropriate introduction to set context.
2. On-site training is conducted in each State for that State as directed by the Office of Water Supply.
3. Courses will be used by many States to train their own personnel following the on-site visit by the training team.

LIMITATIONS:

Assumptions beget limitations and it is well to end this discourse to the user by focusing his or her attention on the things that the MSIS Training Program cannot do.

It is impossible for one training program to fulfill the diverse needs of thirty or more States. This program is a prototype based on SWORCC's interpretation of the common needs of the States as expressed in the BIP's. MSIS training is tailored to specific and diverse needs as exemplified by providing a unit for optional material with each course.

MSIS is not a simple computer system. The instructor must know about MSIS and have used it to prepare for training others; this handbook alone cannot instruct the instructor. However, it does provide a framework for organizing what is to be taught about MSIS and gives brief information that will focus the instructor on major areas to be taught.

It is realized that some troublesome areas may exist. These areas of confusion must be identified and corrected by the user through observation, question, interpretation of evaluation results, or other methods.

MODEL STATE INFORMATION SYSTEM

PART II

TEAM PROCEDURES

Purpose

The purpose of this portion of the handbook is to provide a checklist of all the actions required of the training team to insure a successful training effort. This section was written especially for use by the three-person teams that will visit States to teach water division personnel about MSIS.

States wishing to have their own personnel use these materials to train other in-State personnel may find it necessary to modify the activities listed here.

Description

Part II, Team Procedures, consists of the following sections:

- Management philosophy
- **Organization**
- State visit list
  - A. Pre-visit activities
  - B. On-site activities
  - C. Post-visit activities
- Policies and procedures
- Kickoff
- Warmup
- Evaluation
- Forms

These sections should provide the training team with most information needed to prepare for and report about on-site training.

Management Philosophy

The sole purpose of the MSIS Training Program is to help State and regional personnel learn about the Model State Information System, which in turn aids States and regions **in monitoring the quality of public drinking water.** Correspondingly, the MSIS training philosophy is to provide service and support to States and regions through a training program that moves from the general (Vol. I, MSIS Overview) to the specific (such as Vol.IV, Selection Process and Vol. VI, System Specifications). The individual who follows the progression of courses will end up with knowledge that should expedite his daily use and operation of MSIS.

The training teams are service-oriented. This means that they answer questions, teach courses, lead discussions, run workshops, and try to impart maximum knowledge about MSIS to trainees.

Service orientation also means that the teams utilize a maximum amount of two-way communication, which increases participation and a sense of ownership among trainees; that questions are encouraged at any time, for the unasked question means that subsequent teaching material will not be understood; and that the most participative teaching methods possible are used, for the trainees are professionals with valuable knowledge and insight.

In short, the MSIS training philosophy is respect--of trainees by the team; of each team member by the others. The goal is maximum knowledge learned by trainees, who will use MSIS daily. Any communication and teaching method that facilitates the goal is valid and should be tried out.

Organization

Two teams comprised of three members will train State and regional personnel in four of the six MSIS Training Program courses. Those four courses are:

- MSIS Overview
- MSIS Subsystems
- Data Entry
- Selection Process

The first course is intended for both water division and ADP personnel; the remainder were created for water division personnel. The three team members and their corresponding duties are:

1. Senior Teacher -- Handles most teaching and all administrative tasks while onsite.
2. Junior Teacher -- Handles some teaching assignments; coordinates equipment and supplies; and provides backup to the Senior Teacher.
3. Observor -- Responsible for all evaluation activities (observation of teaching methods, pre- and post-tests, exercises); keeps all written forms (evaluative and administrative).

The three team members will debrief together daily to assess the trainees' progress in learning about MSIS, and to assess the effectiveness of the teaching method. These debriefings will be recorded in the team log. Through debriefings and the team log, the team will correct its own problems, thus achieving the formulative evaluation cited in Part I. The dynamic process of performance, observation, feedback, and correction will result in continuous improvement of the training process.

State Visit List

Many steps are required of team members before, during, and after each State visit. The purpose of this set of steps is to (1) prepare the team as fully as possible for the State visit; (2) utilize resources and manpower in an economical fashion; (3) adhere to the national calendar of State visits with a maximum number of changes; and (4) provide unambiguous criteria for carrying out tasks during the State visit.

The set of steps listed below covers a training team's pre-visit activities, on-site activities, and post-visit activities. Management techniques used include checkoff lists, written reports, and meetings between the teams and the project manager.

Each list of activities contains:

1. Sequential steps

2. Who's responsible for the step

   --ST = Senior Teacher

   --JT = Junior Teacher

   --OB = Observer

   --All = Each team member

3. Explanatory comments

A. Pre-visit activities

Step	Who	Comments
1. Review all of this section	All	
2. Review Part III of each Instructor's Handbook	All	You're responsible for all course content and for answering questions.
3. Review each Participant's Handbook	All	You'll help participants better when you know what their handbooks contain.
4. Examine State visit data	All	Study the detailed information provided from the State Checklist. It will include: . Training facilities . Trainee numbers and type . Name of State training contact . Dates of visit
5. Examine prior team logs	All	Comments in team logs may help.
6. Call State water contact	ST	Verify all State data pertaining to training. Discuss facilities; get his home phone. He is the key person to aid you while onsite.
7. Prepare course modifications	All	Using State data and team logs, prepare any additions or deletions needed. Use Form 1, Course Modifications.
8. Decide on Kickoff method	All	See Kickoff, this section.
9. Decide on type(s) of warmups to use	All	See Warmup, this section.
10. Fill out a daily agenda for each course offered	All	Use Form 2, Daily Agenda.
11. Order all material from Materials Coordinator	JT	Use Form 3, Water Team Materials Inventory, with specific data for this State. Do this at least 5 working days prior to departure.
12. Check off inventory of materials received	JT	Use Form 3.
13. Hold departure briefing	All	Meet with project manager to discuss: a. Course modifications b. Course warmups c. Daily agendas

Step	Who	Comments
13. Hold departure briefing, con't	All	d. Accomodations e. Travel arrangements f. Conversations with State contact g. Policies and procedures Leave copy of Forms 1-3 with the project manager.
14. Last call to State water contact	ST	Set up time and place for first meeting

B. On-site activities.

Arrival day -- Step	Who	Comments
1. Meet with State water contact	ST	Verify with State water contact that the State Checklist is true. If any required items are not obtainable, follow steps listed on State Checklist. Annotate State Checklist for all items and their status when onsite.
	All	Visit facility if possible; modify as needed.
2. Review roster of trainees	All	Fill out Form 4, Course Roster.
3. Finalize course modifications	All	Information about trainees may require changes.
4. Finalize Warmup	All	
5. Finalize Kickoff	All	
6. Finalize daily agendas	All	Use Form 2.
7. Telephone project manager	ST	Report about onsite situation; phone office or home.
8. Copy all charts	JT	Use newsprint; write BIG so that it is clearly visible at back of room.
Day 1		
1. Go to facility at least 1 hour before start of session	All	Make last-minute changes; locate restrooms, telephones, snack bar, etc.
2. Kickoff for this State visit	ST	Stress: . Purpose of MSIS training . MSIS product of many contributors . Courses to be taught . Materials to be left for State use . Evaluation . Certificate of completion . MSIS training philosophy . Encourage questions . Introduce team
3. Get updated roster of trainees	ST	Pass around Form 4 for all to sign. Get copies made so every trainee has one for himself. Keep the master.

B. On-site activities, con't

Day 1, con't

Step	Who	Comments
4. Warmup	All	**Help trainees get to know each other and feel at ease.**
5. Course pre-test	OB	Pass out pre-test. Allow 10-15 minutes to fill out both Background Information and pre-test. Collect all papers. Record scores on Form 5, pre- and post-test analysis.
6. Course Content	All	Follow Part III of this Instructor's Handbook.
	OB	Record class analysis on Form 6.
7. During lunch, sign student certificates	ST	Prepare one certificate for each trainee on Roster.
8. Course post-test	OB	Pass out post-test; allow 10 minutes to complete it. Collect all papers. Record scores on Form 5.
9. Award certificates	ST	Personally award certificates to each trainee
10. Daily call to project manager	ST	By 5 p.m. Cincinnati time if possible, call project manager.
11. Team debriefing	All	Daily debriefing to cover: a. results of pre- and post-tests b. problems c. successes d. make up new observor's class analysis (form 6) for tomorrow e. observations f. recommendations (will be typed later and shared with other water team).
12. Write up daily log	Rotate	Write up points a-f in daily log, which will be turned in at end of trip.

Day 2

Repeat Day 1's steps 3-12

B. On-site activities, con't

Step	Who	Comments
Day 3		
Repeat Day 1's steps 3-12		
Day 4		
Repeat Day 1's steps 3-12		
Day 5		
Repeat Day 1's steps 3-12		
13. Give State contact set of MSIS training materials	ST	Use Form 7, Water Training Sign Off Sheet.
14. Have State Contact check off that training was completed	ST	Use Form 7.
15. Thank all local support personnel	All	Especially thank the State water contact for his/her help this week and before the visit.
Departure Day:		
1. Pack all extra material to return to Materials Coordinator	JT	Use Form 3.

C. Post-visit activities

	Step	Who	Comments
1.	Complete a Trip Summary	OB, ST	Use Form 8, Water Team Trip Summary
2.	Have Team Recommendations Typed up from Team Log	ST	Use Form 9, Water Team Recommendations
3.	Trip Debriefing	All	Meet with project manager to discuss: a. How it went 1. per trainees 2. per team b. Results of Evaluation c. Written Team Recommendations d. What Other Teams Need to Know Turn in updated versions of forms 1-9 and the team log.
4.	Review Form 9, Water Team Recommendations From the Other Team	ST	The other team may have recommendations you can use.

Policies and Procedures

Aside from the procedures outlined for pre-visit, on-site, and post-visit activities, the following rules apply:

1. Follow explicitly the State Checklist, Section 2.0. It contains requirements which the State must fulfill, and whether or not the requirement was promised and verified by telephone prior to the visit.

2. For other circumstances which appear to prevent carrying out training of water division personnel and cannot be resolved with the State water contact, immediately telephone the project manager. Notify the State water contact of the problem, having called the project manager, and the next steps authorized by the project manager. Carry out those steps in detail.

   In the team log, write up the problem, attempts made to resolve it with the State water contact, time and content of conversation with project manager, and authorized steps.

   Carry out each authorized step, noting all actions in team log.

3. In emergency situations (illness, crisis), call the project manager immediately; if unable to reach her, call the associate project manager at work or home, or the Director, CSD at work or home.

Kickoff

The purpose of kickoff activities is to set the desired tone for the entire State visit. The kickoff, or opening presentation, takes place first thing on Day 1.

Several items must be covered in the kickoff; they are listed more or less in their order of importance.

1. Purpose of State Visit: The purpose of each State water team visit is to help State personnel learn as much as possible about MSIS. Why? So that MSIS is maximally useful to this State in meeting the requirements of the SDWA.

2. MSIS is the Product of Many Contributors: While the history of MSIS will be covered in detail today, trainees need to know that the computer system, MSIS is the product of many contributors. It is based on the requirements of the Safe Drinking Water Act and the regulations; its form and requirements have been shaped by several agencies and groups, such as the Office of Water Supply, the Conference of State Sanitary Engineers, EPA regional personnel, and advisory groups.

3. The MSIS to be installed in this State has been developed and tested

by the SouthWestern Ohio Regional Computer Center, and approved by the Office of Water Supply after an intensive acceptance test at COMNET.

3. MSIS training philosophy: The sole purpose of the water team is to help State personnel, using a variety of methods--teaching course content, answering questions, conducting workshops where trainees practice using input forms and interpreting output reports, giving out self-measurement exercises, and administering pre- and post-tests which measure knowledge gained. The team respects the professional knowledge of trainees, and needs their comments and observations. Questions are encouraged at any time, for the unasked question means later information won't be understood.

4. Courses to be taught: While normally the water team teaches Vols. I - IV, some States have not selected all four courses. See the State Checklist, Section 2.0, for latest information. Tell the trainees what you will be teaching on what day.

5. Material left in State: OWS has authorized the SWORCC water team to leave the following training materials in each State:

   1 slide/cassette package for each of Vols. I-IV, with 2 copies of each accompanying workbook (binders 3,6,9,12).

   1 set of Vols. I - IV for training program (binders 1,2,4,5, 7,8,10,11).
   1 set of camera-ready copy of binders 1-12.

   The DP team will deliver all versions of Vols. V - VI, (binders 13,14). camera ready copy, to the State DP contact.

6. Evaluation: Evaluation will be performed in both formal and informal ways. Formal evaluation will be based on a pre- and post-test given for each course; papers will be collected and scored. Informal evaluation will be conducted through self-measurement exercises, which will be completed in class and discussed. The teaching team evaluates itself, relying especially on the observer's analysis of effectiveness of teaching, in daily debriefings.

7. Certificates of completion: Each trainee will receive a certificate of completion if he takes the entire course (a certificate will not be awarded if he drops in for an hour or so), to be presented at the end of the course.

8. Introductions: Introduce each team member, having them stand up. Tell their job for this week and stress that any questions anybody has may be directed to any team member at any time.

9. Summary: Stress again that the team is in this State to serve; it's goal is to help professional personnel learn as much as possible in the time allotted about MSIS, in order to make MSIS as useful as possible to the State.

Warmup

The purpose of the warmup is to set people at ease before training begins; it is also useful after a heavy lunch, or in a hot room to wake everybody up. The MSIS Training Program shows warmups as a daily, morning event, but the team may prefer another frequency. Caution: Warmups need to be selected prior to the day used!

Warmups are useful even if it appears to the team that most trainees know each other. Why? They may know each other only by name, or only in a working relationship. Warmups help the group feel at ease so it will later be confident enough to ask questions (take a risk), disagree with or challenge a teacher (stand apart from the group), or answer one another's questions (demonstrate so much ownership that they are surrogate teachers).

Types of Warmups

Warmups vary from the simple to complex. Some simple ones are discussed here. See the team copy of Davis and McCallon, Workshops: Planning, conducting, and evaluating, p. 147-149 for more complex warmups.

1. "Who are you?". Have class form triads (three people). Ask each member of the triad to find out four things about another member which will be shared with the entire group as an introduction. Allow 10 minutes for conversation; then reconvene entire group and have everybody introduce one other person.

2. "Who are we?". Variation of no. 1 in which the triad seeks to find commonalities among itself. Obvious commonalities are that they work for one agency, etc. Have the group find at least one non-work commonality (sports, leisure, volunteer groups, church work) which is shared by the three.

3. "Silent puzzle". Have the class break into small groups of five persons sitting together. Give each person a few pieces of a mini-puzzle. Tell them to work together but silently to put together the puzzle. First group done gets a gold star added to the certificate of completion. Permit 10 minutes to perform.

In summary, the purpose of warmups is to help people feel at ease with one another, and therefore willing to take risks, stand out from the group, and enhance psychological ownership of MSIS. Finally, it is just nicer to work together when one feels confortable and in friendly surroundings.

Evaluation

Evaluation is performed in three basic ways in the MSIS Training Program. First, formal evaluation of trainees is accomplished through administering pre- and post-tests for Vols. I-IV. Pre- and post-tests are collected, scored, and recorded for several later analyses which will be reported to OWS. Pre- and post-tests may be found in Part III, Course Content, of this Instructor's Handbook.

Second, informal self-evaluation is performed by trainees using the exercises that accompany Vols. I-IV. Exercises are always followed by question-and-answer sessions so that trainees can discuss correct responses.

Third, the team itself continuously evaluates its performance through several mechanisms:

1. The observer's main responsibility is to analyze the effectiveness of teaching focusing especially on those areas which the teachers have specified.

2. Daily debriefings which cover trainee performance on pre- and post-tests, degree and type of trainee participation, successes, problems, and recommendations. The daily debriefings are written up in the team log.

3. Post-visit debriefings between the project manager and the team, focusing on "how it went" and recommendations for change that should be implemented in all water training.

These devices all comprise what is called "formulative evaluation" in the educational research literature, meaning that the team constantly improves its product and services.

Philosophically, MSIS relies as little as possible on formal tests for evaluation, preferring self-measurement (exercises; questions and answers) and group analysis and improvement (observer; daily debriefings; team log; post-visit debriefing with project manager). The goal is an effective teaching team that works with trainees and among its members to communicate the maximum amount of knowledge about the Model State Information System.

Forms

There are nine forms designed for more-or-less constant use by the SWORCC water teams. They are:

1. Course modifications
2. Daily agenda
3. Water team materials inventory
4. Course roster
5. Pre- and post-test analysis
6. Observer's class analysis
7. MSIS training sign off form--water team
8. Trip summary--water team
9. Water team recommendations

The forms are intended to capture information when it is fresh; we can't rely on memory to clearly delineate events six States and ten weeks ago.

All data on the forms will be used in the two final reports, one covering the history and management of OWS-77-02; the other covering effectiveness of training.

Course Modifications
(Form 1)

State: ______________ Region: _________________ Team: _________________

Course: __________________ __________________________________

Date: __________________ __________________________________

I. Proposed modifications.

Modification Number	Unit	Modification Proposed	Reason

II. Recommendations for permanent modifications.

Modification Number	Reasons and Proof (Cite proof, such as unusually high number of questions; poor post-test scores, etc.)

DAILY AGENDA
(Form 2)

State: ____________ Region: ________________

Course: _________________________________ Date: __________________

EVENT	TIME
Break	
Lunch	
Break	
Wrap-Up	

Water Team Materials Inventory
(Form 3)

State: ____________ Region: ________________ Packer: __________________

Scheduled Date of Departure on Trip: _________________ Date Packed: __________________

Date of Request: ____________

Name of Requestor: ___________________

I. Materials for teaching Vols. I-IV. (Circle binder; add numbers)

Binder Number	Number Needed	Number Packed	Number Used	Number returned to SWORCC
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

Form 3
-2-

II. Materials to be left in State

A. Trainees

Binder No.	Number Needed	Number Packed	Number Used	Number returned to SWORCC
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

B. **Materials left with State water contact**

Binder No.	Number Needed	Number Packed	Number Used	Number returned to SWORCC
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

III. Student certificates.

Number Needed	Number Packed	Number Used	Number returned to SWORCC

Course Roster
(Form 4)

State: ______________ Region: ______________ Course: ________________

Date taught: ____________________

Name	Agency	Telephone Number

(copy for all trainees; keep master)

Pre- and Post-Test Analysis

(Form 5)

State: ______________ Region: ________________ Course: __________________

Date Course given: ___________________ Observer: ___________________

A. Trainees

1. Number of trainees taking pre-test _________
2. Number of trainees taking post-test _________
3. Useable pairs of tests (basis of following data): _________

Form 5

-2-

B. Trainee Scores.

Trainee ID	Pos. No.	Correct Answer	Pre-test Answer	% Pre-test Correct	Post-test Answer	% Post-test Correct	Net Change

Observer's Class Analysis
(Form 6)

State: ____________ Region: _____________ Date: ________________

Course: _____________________ Observer: _________________

I. Items requested by Senior or Junior Teacher.

Item	Tally of Occurrences	Implications

II. Communications.

Check the most appropriate point to describe each major event, taken as a whole. Insert events as needed.

Kickoff	0	0	0	0	0
Warmup	0	0	0	0	0
Pre-Test	0	0	0	0	0
Unit 1	0	0	0	0	0
Discussions	0	0	0	0	0
Exercises	0	0	0	0	0
Unit 2	0	0	0	0	0
Discussions	0	0	0	0	0
Exercises	0	0	0	0	0
Unit 3	0	0	0	0	0
Discussions	0	0	0	0	0
Exercises	0	0	0	0	0
Post-Test	0	0	0	0	0
Course Summary	0	0	0	0	0
	Negative class response (asleep, bored, hostile)	Some class response (some questions, a few listening)	Average class response (most listening, about 1/3 asking questions)	High class response (almost all listening, more than half asking questions)	Constant class response (all listening, asking questions, body alert.)

Additional Notes:

III. Course content.

Fill in the following information about the exercises.

Unit	Exercise Form Number	Time class took to fill out	Questions asked by class (major ones)

III. Course content.

Fill in the following information about the exercises.

Unit	Exercise Form Number	Time class took to fill out	Questions asked by class (major ones)

IV. Problems noted.

List any content, communications, facilities or other problem that should be brought to the team's attention.

V. Suggestions.

List any suggestions which may aid your team.

MSIS Training Sign Off Form

Water Team

(Form 7)

State: ____________ Region: ____________ Senior Teacher: ________________

I. The following courses which are checked off, have been completed by the SWORCC water team in this State:

_____Vol. I, MSIS Overview

_____Vol. II, MSIS Subsystems

_____Vol. III, Data Entry

_____Vol. IV, Selection Process

II. The following materials have been turned over to this State by the SWORCC water team

Binder Number	Camera-Ready Copy	1 Duplicate
1		
2		
3		
4		
5		
6		
7		
8		

Slide/Cassette package	1st set*	Camera-ready copy (workbook only)
Vol. I		
Vol. II		
Vol. III		
Vol. IV		

Signed: ______________________________

____
Job Title

____
Agency

____
Date

* 1 copy of slides, cassettes and 2 copies each of binders 11-14.

Trip Summary
Water Team

(Form 8)

State: ________ Region: ______________ Team: ______________________

Dates in State: ______________ ______________________

____

I. State Water Contact.

Name: ______________________

Job Title: ______________________

Agency: ______________________

Telephone: ______________________

II. Trainees.

Course	Total Number Attending	Number reported prior to visit
I		
II		
III		
IV		

III. Pre- and Post-Tests.

Course	Number of useable pairs	Average Net Change
I		
II		
III		
IV		

IV. State checklist.

Of ______ required items in the State Checklist, Section 2.0,

______ were provided upon arrival of the training team.

______ were provided within the first 2 days.

______ were provided after 2 days.

______ were never provided.

V. Successes.

List and briefly discuss not more than 3 high points of this State's Water Division training in MSIS.

VI. Problems.

List and briefly discuss not more than 3 problems.

VII. Other comments.

Water Team Recommendations

(Form 9)

State: ______________ Region: ____________ Team: ____________________

Dates in State: ________________ ______________________________

____

List all recommendations except course modifications (use Form 1) for both water teams to use in remaining States.

Check which categories of recommendations are covered below:

_____ State Checklist

_____ Materials taken to State

_____ Course content

_____ Part II--Team procedures

_____ SWORCC support

_____ UC support

_____ Other: ______________________

_____ Other: ______________________

MODEL STATE INFORMATION SYSTEM

PART III

COURSE CONTENT

FOR

MSIS OVERVIEW

INTRODUCTION:

The purpose of Part III of the handbook is to provide the instructor with everything needed to conduct the training.

Before plunging into the details about what will be taught, two definitions are necessary.

Course: The teaching content within individual MSIS Training Program volumes

Unit: A section within the course: Units are logical groups of information divided into manageable periods of time.

For this course, MSIS Overview, there are two required units and one optional unit.

Part III begins with course information. Purpose, summary of course content, and checklist of materials needed are covered.

Next come several sets of information about the two required units. The units are self-contained and complete unto themselves, facilitating variable length breaks between units, change in instructors, and ad hoc modifications. Unit information includes:

1. Goals

2. Behavioral objectives and self-measurement techniques

3. The sequence of events, which gives a snapshot of all unit activities

4. Detailed sequence of events: It painstakingly lists in double-page format each teaching topic; methods to teach it; specific slides, charts, etc. needed; and detailed instructor notes that explain the topic's contents. The detailed sequence of events was designed with space between events to allow for changes to be inserted as notes. Such additional material that cannot be inserted within the framework of a unit may be included as the instructor sees fit in the additional unit, Optional Material.

It is expected that, with repeated use, this material will be tailored to the individual style of the instructor and the needs of the particular population undergoing training. It is assumed that, as the instructor becomes more familiar with teaching this course, he will rely mainly on the detailed sequence of events to orchestrate his efforts.

The applicability of this course to each State will depend upon the specific MSIS subsystems selected by that State. It is important, therefore, for the trainer to know beforehand what subsystems were not selected and will not be used by the State so that in the presentation references to those subsystems can be eliminated or at least minimized.

It is important to note, though, that although references to the subsystems not selected should be minimized, it must be made clear that the Variances and Exemptions and Enforcement Actions subsystems do contain a portion of the information required to be reported when dealing with federal reporting requirements. If either or both of those subsystems have not been selected, the information that would normally be reported by that (those) subsystem(s) will have to be prepared manually.

PURPOSE:

The purpose of this course is to attain two types of trainee goals, content and non-content. The content goals are knowledge acquisition and skill attainment. The non-content goal is attitude. The four specific goals for this course are:

Knowledge:

Trainees will know the main topics and provisions in the Safe Drinking Water Act (SDWA) of 1974 and in the subsequent resulting National Interim Primary Drinking Water Regulations.

Trainees will understand the basic intent of the Model State Information System and, in general, how it accomplishes that intent.

Skill:

Trainees will be able to manage the total MSIS system effectively and learn the more detailed information about the system.

Attitude:

Trainees will be confident in their basic knowledge of the system and in their ability to manage it effectively.

SUMMARY OF COURSE CONTENT:

Following are the units that comprise this course together with the goals, behavioral objectives, time allocation, and instructional techniques for each unit:

Unit 1: SDWA, Regulations, and Background

Goal: To familiarize the trainee with the events leading to the development of MSIS

Behavioral Objectives:

1. Define contaminant, public water system, and maximum contaminant level.
2. Explain what requirement of the Act MSIS fulfills.
3. Explain the difference between a variance and an exemption.

4. State the four conditions a PWS must meet to be excepted from the regulations.
5. Define Community PWS.
6. List the four contaminant categories.
7. List the five federal reporting requirements.
8. Name at least one reason why MSIS was developed by the federal government for the States.
9. Name at least one reason why the system is decentralized.

Time Allotted: **Three hours**

Unit 2: Overview of the MSIS

Goal: To give the trainee a basic understanding of MSIS

Behavioral Objectives:

1. Explain the difference between on-line and batch processing.
2. List the two basic services which MSIS provides.
3. Name the nine subsystems of MSIS.
4. Name at least one function for each subsystem.

Time Allotted: Three hours

LIST OF MATERIALS NEEDED FOR COURSE

Instructor Materials Required:	Unit 1	Unit 2	Unit 3	Unit 4
Instructor's Handbook (Vol. I)				
35mm slides/notes				
35mm slide projector				
Newsprint and stand				
Felt marker (large)				
Handouts				
Exercise forms				
Discussion questions				
Pre and post evaluation forms				

Participant Materials Required:	Unit 1	Unit 2	Unit 3	Unit 4
Participant Handbook (Vol. I)				
Pencils				
Note Paper				

UNIT 1: SDWA, REGULATIONS, AND DEVELOPING MSIS

Goal:

To familiarize the trainee with the events leading to the development of MSIS

Behavioral Objectives:

1. Define contaminant, public water system, and maximum contaminant level.
   a. Condition: From recall
   b. Accuracy: 67%
   c. Method: Written exercise
2. Explain what requirement of the Act MSIS fulfills.
   a. Condition: From recall
   b. Accuracy: 100%
   c. Method: Written exercise
3. Explain the difference between a variance and an exemption.
   a. Condition: From recall
   b. Accuracy: 100%
   c. Method: Written exercise
4. State the four conditions a PWS must meet to be excepted from the Regulations.
   a. Condition: From recall
   b. Accuracy: 75%
   c. Method: Written exercise
5. Define Community PWS.
   a. Condition: From recall
   b. Accuracy: 100%
   c. Method: Written exercise
6. List the four contaminant categories.
   a. Condition: From recall
   b. Accuracy: 75%
   c. Method: Written exercise
7. List the five federal reporting requirements.
   a. Condition: From recall
   b. Accuracy: 80%
   c. Method: Written exercise
8. Name one reason why the federal government developed MSIS for the States.
   a. Condition: From recall
   b. Accuracy: 100%
   c. Method: Written exercise
9. Name at least one reason why the system is decentralized.
   a. Condition: From recall
   b. Accuracy: 100%
   c. Method: Written exercise

SEQUENCE OF EVENTS: VOLUME I, UNIT 1

TIME	ACTIVITY
15	Warm-up
10	Pre-test
10	Introduction of Unit
30	Slides/lecture: Safe Drinking Water Act
5	Discussion
10	Exercises/Review
35	Slides/lecture: The Regulations
5	Discussion
15	Exercises/Review
20	Slides/lecture: Developing MSIS
5	Discussion
10	Exercises/Review
10	Summary

Total Time: 3 hours

NOTES

DETAILED SEQUENCE OF EVENTS

VOLUME I, UNIT 1

The Detailed Sequence of Events is presented in double-page format in order to provide the instructor with an instant view of what is to be taught, how, and in what sequence. The column headings used are:

Event Number - The numbers under this heading represent the main unit activities and the sequence in which they should be presented.

Time - The numbers represent the planned duration of the event in minutes. These times have been tested and can be used to estimate the level of detail intended for the event.

Support Form Number - Identification symbols of the materials to be used in conjunction with the presentation: These symbols also appear on the reproductions of the material inserted at the end of the unit. From left to right the digits represent the volume, the unit, the type of media, and the sequence of that media within the unit. For example, I1A3 means Volume I, Unit 1, Answer sheet number 3. The media abbreviations are defined as follows:

A - Answer sheet

C - Chart on newsprint

E - Exercise handout

H - Information handout

S - Slide

T - Test

Event & Method - Recommended content and teaching approach. See Part II of this volume for additional suggestions.

Instructor Notes - (1) Refers instructor to more detailed material in Part IV, Extracts from MSIS Documents; and (2) presents information which should either be taught or known in order to answer questions. All the material in the Instructor Notes must be mastered prior to teaching this course to feel confident during teaching.

Volume I, Unit 1

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
1	15	I.1.C1	Warm-up

Instructor Notes

For detailed discussion of warm-up and kickoff activities, see Part II.

The intent of these activities is to state clearly what's to be done today, why, and how long it will take. The MSIS training philosophy of aiding States to use MSIS will be emphasized, along with the team's commitment to answering all questions that may arise.

Before class begins, put today's agenda on newsprint, using this example:

Today's Agenda	Date	Time
Warm-up		
Pre-test		
Unit 1		
Break		
Unit 1, con't		
Lunch		
Unit 2		
Break		
Unit 2, con't		
Post-test		
Student Certificates		

Volume I, Unit 1

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
2	10	I.1.T1	Pre-test
3	10	I.T1L I.1.S1	Slides & lecture: Introduction to Unit . 1 goal . 9 behavioral objectives . Exercises . Agenda 1) SDWA 2) Regulations 3) Developing MSIS

Instructor Notes

Pass out pre-test for MSIS Overview; collect pre-test.

See p. 46 for goal and behavioral objectives.

Exercise sheets will be passed out during the unit; they are for trainee use, and will not be graded or collected. Urge the trainees to keep them, as answers will be discussed and may be useful for further reference.

The agenda for this training unit is:

1. the Safe Drinking Water Act of 1974,
2. the National Interim Primary Drinking Water Regulations, and
3. developing the Model State Information System (MSIS).

1. The Safe Drinking Water Act (SDWA) of 1974 requires the Environmental Protection Agency (EPA) to establish regulations with respect to drinking water.

2. The EPA regulations expand the SDWA with specific requirements regarding the quality of drinking water provided to the public.

3. Developing the Model State Information System (MSIS) required investigation authorized by the Office of Water Supply (OWS) in order to determine the method for meeting the reporting requirements of the Regulations.

Volume I, Unit 1

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
4	30	I.1.1S I.1.S8	Slides & lecture: The SDWA .Purpose .Sections

Instructor Notes

See excerpts from PL 93-523 in Part IV.

The Safe Drinking Water Act, PL 93-523, was passed on December 16, 1974. The Act amended the Public Health Service Act; its purpose is to assure that the public is provided with safe drinking water.

PL 93-523

The sections of the Act are:

Part A -- Definitions of key terms, such as primary drinking water regulation, supplier of water, contaminant
Part B -- Public water systems which fall under coverage of the Act; requirement that the EPA Administrator publish national interim primary and secondary drinking water regulations, declaration that a State can obtain primary enforcement responsibility for the Act; consequences of State failure to assure enforcement; granting exemptions from requirements
Part C -- Protection of underground sources of drinking water
Part D -- Emergency powers of the Administrator
Part E -- General provisions, such as assurance of adequate supplies of chemicals necessary for water treatment, funds for State programs, required records, inspections, and role of other agencies and groups

In the following notes, reference to the specific section of the Act is given where possible.

Definitions

The SDWA defines:

Contaminant -	any physical, chemical, biological or radiological substance or matter in water (1401.6)
Public water system (PWS) -	a system for the provision of piped water to the public for human consumption which has at least 15 service connections or serves at least 25 individuals (1401.4)

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
4, con't			Slides & lecture: The SDWA . Definitions . Scope . Regulations . Variances and Exemptions

Instructor Notes

Maximum contaminant level (MCL) - the maximum permissible level of a contaminant in water which is delivered to any user of a PWS (1401.3)

Scope

Section 1411 states that national primary drinking water regulations will apply to all public water systems except those which:

1. consist only of distribution and storage facilities (no collection or treatment facilities),
2. obtain water from another PWS to which the regulations do apply,
3. do not sell water, and
4. are not carriers of interstate passengers.

Regulations

The Act states that the EPA will develop regulations which will specify contaminants, maximum contaminant levels, and criteria and procedures to assure dependable water quality. It differentiates these regulations into primary and secondary and defines primary drinking water regulations as those which protect the health of the people. Secondary drinking water regulations are those which govern other aspects of water quality, such as the color, odor, or taste.

The MSIS training courses deal only with the primary regulations as they are the only ones developed so far.

The Act also provides guidelines for when and how interim regulations and the final or permanent regulations will be put into effect. It specifies that the secondary drinking water regulations will be developed and issued.

Variances and Exemptions

Section 1415 deals with procedures to be used when granting variances that permit exceeding a national primary drinking water regulation. States may issue variances because a PWS cannot meet the requirements despite applying best technological or treatment techniques. Specific steps, such as public notice and public hearings, notifying the Administrator, and monitoring compliance are also set forth.

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
4, con't			Slides & lecture: The SDWA . Variances and Exemptions (continued)

Instructor Notes

Section 1416 states that a State may issue an exemption due to compelling factors such as cost, if the PWS was in operation on the effective date of the requirements, and if the exemption will not result in an unreasonable risk to health.

The Safe Drinking Water Act provided for the granting of variances and exemptions to PWS's from MCL and treatment technique requirements primarily in order to lessen the economic impact of the regulations. EPA has therefore issued a memorandum, "Guidance for the Issuance of Variances and Exemptions", dated 1/11/77. The following clarifying information was extracted from that document. Since no treatment techniques have been required by the regulations, only variances or exemptions for MCLs may be granted.

Variances and exemptions from MCLs are similar in that each:

1. has a stringent process for granting,
2. requires that such granting will not have an undue health effect on its users, and
3. permits a contaminant level higher than that permitted in the regulations.

However, they vary in more significant ways:

1. An exemption applies only to an existing PWS; no exemptions will be permitted to future PWS's.
2. Exemptions are basically granted when a PWS cannot afford generally available treatment techniques, whereas variances are granted when the raw water is unusually poor and the generally available treatment techniques are used and do not reduce the contaminant level below the MCL.
3. Usually an exemption will expire in 1981, but a variance has no time limit specified by the SDWA.

The sequence of granting shows an exemption being granted to a PWS first, in order to permit engineers to design and install an effective treatment technique. When that treatment technique proves unable to decrease the contamination below the MCL, then the PWS would apply for a variance.

Volume I, Unit 1

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
4, con't			Slides & lecture: The SDWA . Variances and Exemptions, con't . Primacy

Instructor Notes

Due to the health hazard, no exemption or variance from the microbiological MCL may be granted. Specific guidelines for variances and exemptions for other contaminants have been distributed by OWS, with special caution given to nitrate due to its effect on susceptible infants.

Primary Enforcement Responsibility ("Primacy")

Section 1413 states that a State meeting certain requirements may be granted the primary enforcement responsibility by the Administrator. Basic conditions for State primacy are that the State:

1. has adopted no less stringent regulations,
2. has adopted enforcement procedures,
3. will keep records and report to the federal government,
4. has adopted no less stringent requirements for the granting of variances and exemptions, and
5. has adopted and can implement plans for the provision of safe water under emergency conditions.

The Model State Information System (MSIS) was developed to help States fulfill the third requirement for primacy, keeping records and reporting to the federal government.

Volume I, Unit 1

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
5	5		Discussion
6	10	I.1.E1 I.1.A1	Exercise

Instructor Notes

Answer questions and ask some of participants.

Give about 3 minutes to fill out sheets. After trainees have filled out the exercise, ask for verbal responses. Discuss responses, giving correct answers. Finish up with general question and answer session.

When passing out exercises, stress again that all exercises are for self-measurements. They are not tests, and are not collected. However, participants may want to keep them in the pockets of their Participant Handbook.

Volume I, Unit 1

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
7	35	I.T2L I.1.S9 I.1.S14	Slides & lecture: The EPA Regulations . Purpose . Sections

Purpose.

The purpose of the regulations is to set forth basic legal requirements. The regulations were developed by the Office of Water Supply, which was in response to the Safe Drinking Water Act, PL-93-523, delegated administrative responsibility for carrying out the Act by the EPA Administrator. Several groups participated in the regulations' development, including State water supply agencies, the Conference of State Sanitary Engineers, The National Drinking Water Advisory Council, and the League of Women Voters and the general public through public hearings.

There are two parts of the regulations which concern us:

1) The National Interim Primary Drinking Water Regulations, hereafter called "Regulations"

2) The Implementation Regulations, hereafter called the "Implementation Regulations"

The Regulations define sampling, analysis and monitoring requirements for drinking water; the Implementation Regulations define federal reporting and State record-keeping requirements. These regulations have been published in the Federal Register.

See Part IV for a copy of the Regulations and the relevant part of the Implementation Regulations.

Regulations--Sections.

The Regulations contain these sections:

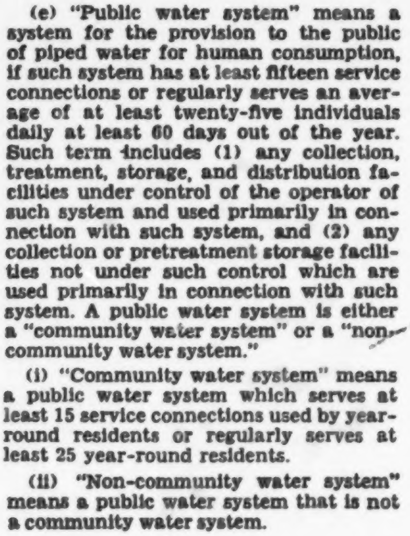
Subpart A -- General: includes definitions, coverage, variances and exemptions, effective date.
Subpart B -- Maximum Contaminant Levels: covers inorganic chemical, organic chemical, turbidity, microbiological, and radionuclide contaminants.
Subpart C -- Monitoring and Analytical Requirements: covers the five contaminant categories, alternative analytical techniques, approved laboratories, and monitoring consecutive PWS's.
Subpart D -- Reporting, Public Notification, and Record-keeping: deals with information that PWSs supply.

Event No.	Time (In min.)	Support Form No.	Event & Method
7, con't			Slides & lecture: The EPA Regulations . Sections, con't

Instructor Notes

Subpart A -- General

A major area of Subpart A is definitions. During the public hearings, it became apparent that some of the terms used by the Safe Drinking Water Act required more precise definitions. The resulting key definitions are found in section 141.2:



> (e) "Public water system" means a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year. Such term includes (1) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system, and (2) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. A public water system is either a "community water system" or a "non-community water system."
>
> (i) "Community water system" means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.
>
> (ii) "Non-community water system" means a public water system that is not a community water system.

Note that the basic criteria for a water system supplying human drinking water are:

- . 15 service connections, or
- . 25 individuals served daily for at least 60 days per year.

These criteria permit distinguishing between the differing health effects of a drinking water source very infrequently used (not covered by the scope of the Act) vs. a source that is used at least 60 days per year.

A further distinction is made between consumption by year-round residents (community PWS) vs. intermittent consumption (non-community PWSs). This distinction is carried through to the applicability of the five types of MCLs to the two types of PWSs, as we see in Subpart B.

Volume I, Unit 1

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
7, con't			Slides & lecture: The EPA Regulations . Sections, con't

Subpart B -- Maximum Contaminant Levels (MCLs)

The regulations specify:

1. Ten inorganic contaminants--Arsenic, Barium, Cadmium, Chromium, Flouride, Lead, Mercury, Nitrate, Selenium, and Silver (141.11);
2. Six organic chemical contaminants--Endrin, Lindane, Methoxychlor, Toxaphene, 2,4-D, and 2,4,5-TP Silvex (141.12);
3. One all-inclusive physical contaminant called turbidity (141.13);
4. One bacteriological contaminant--Coliform bacteria (141.14);
5. Two all-inclusive measureable radiological contaminant categories called Gross Alpha and Gross Beta (within the Gross Alpha category, combined Radium-226 and Radium-228) (141.15)

The differing applicability of the MCLs to the two PWS categories is:

1. Inorganic: 1) Nitrate applies to both community and non-community PWSs because even intermittent exposure can have an adverse health effect on susceptible infants in a short period of time.
   2) The other inorganics apply to community PWSs only.

2. Organic: Applies only to community PWSs; they cover pesticides and herbicides exclusively.

3. Turbidity: Applies to any PWS if it uses surface water sources in whole or part. The specified levels may be exceeded if the PWS can demonstrate to the State that the higher turbidity level does not:
   1) interfere with disinfection, and
   2) prevent effective disinfectant application, and
   3) interfere with microbiological determinations.

4. Microbiological: Applies to all PWSs.

5. Radionuclides: Applies to community PWSs only.

Subpart C -- Monitoring and Analytical Requirements

Major requirements are for:

1. analytical techniques for each specific contaminant,
2. frequency of sampling, based on factors such as population served and whether the PWS has community or non-community status,

Volume I, Unit 1

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
7, con't			Slides & lecture: The EPA Regulations . Sections, con't . Implementation Regulations

Instructor Notes

3. use and frequency of check samples, which are used when the original sample showed an MCL violation,
4. provision for alternative analytical techniques,
5. requirement that all analyses be performed by approved laboratories or personnel, and
6. monitoring of consecutive public water systems.

Subpart D -- Reporting, Public Notification, and Record Keeping

This section covers:

1. Requirements for reporting by PWSs to the State.
2. Notification by the PWS to the public under specified circumstances: methods of communication may include TV and newspaper, mailed with normal water bill, separate mailing, posting notice in local Post Office; the conditions under which each may be used, or is required, are set forth.
3. Records which must be kept by the PWS.

Implementation Regulations

A major part of the Implementation Regulations is Section 142.15, Reports by States, which is the basis of MSIS.

The State, having assumed primacy, is obligated to keep records and report to the federal government in compliance with the implementation regulations. The regulations require that the State monitor PWS compliance with the drinking water regulations, maintain records on PWS compliance, and report to the EPA as follows:

1. additions or corrections to the State's inventory of public water systems, annually;
2. a summary of violations by public water systems, annually;
3. enforcement actions taken, annually;
4. a summary of the status of variances and exemptions, annually; and
5. the granting of a variance or exemption, promptly.

The first four annual requirements for reporting by States to the EPA are met by the Model State Information System. The information is prepared on computer magnetic tape as directed by EPA; however, printed versions can be made for transmittal with the tapes to EPA and for public inspection. The fifth reporting requirement, prompt notification of the granting of a variance or exemption, is handled separately from MSIS.

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
8	5		Discussion
9	15	I.1.E2 I.1.A2	Exercise

Instructor Notes

Answer questions, lead brief class discussion.

Give 5 minutes to fill out sheets. After participants have filled out their exercises, put up answer list. Discuss all points.

Volume I, Unit 1

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
10	20	I.1.S14 I.1.S19	Slides & lecture: Developing MSIS • Survey of States • States wanted computer system • Centralized, on-line system • Decentralized, batch system • AMS General Design

Instructor Notes

Survey of States

EPA's Office of Water Supply (OWS) was allocated funds to administer the SDWA. OWS decided to ask the States:

> If you were given a sum of money for keeping records and reporting to the federal government, how would you use the funds?

The overwhelming answer from the States was that they would each develop a computer system with the money.

Authorizing a computer system

It was then decided that it might be better to use the allocation to develop one large computer system for use by all the States because:

1. the funds would be used in a way that the majority desired, i.e. to develop a computer system,
2. the combined funds could develop a better system, and
3. the system would be uniform, with standard output to be sent to the federal government.

The next question that arose was:

Centralized on-line vs. Decentralized batch

If one large computer system were developed, should it be:

1. a centralized, on-line system at the EPA computer facility to which the States would have access via telecommunications,
2. a centralized, on-line system using STORET, the existing system used to hold the National Inventory, or
3. a decentralized, batch system which would be installed on each State's selected computer facility, as well as the EPA central facility, to be used by the State as it saw fit?

A feasibility study was performed by American Management Systems (AMS) and a decentralized, batch system was chosen because:

1. it was the States' preferred method,
2. it would be less expensive,
3. it would give the State more control of the integrity of the data in the system,
4. it would better assure confidentiality of State data, and
5. it would permit greater flexibility by allowing the State to modify the system for its own individual circumstances.

Volume I, Unit 1

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
10, con't			Slides & lecture: Developing MSIS . SWORCC detailed design . Minimum hardware configuration

Instructor Notes

Designing the MSIS

Once the decentralized, batch system approach was recommended by AMS and approved by the EPA, AMS continued its effort with the general design of a model which was called the Model State Information System (MSIS). The MSIS general design included the subsystems and their functions.

When the general design of the MSIS was completed, the SouthWestern Ohio Regional Computer Center (SWORCC) was authorized to do the detailed design, development, and installation planning for MSIS.

Minimum Hardware Configuration

As a portion of its work, SWORCC developed a minimum hardware configuration that defined the computer facility needed to operate the batch MSIS. It was developed to:

1. help define the scope of the detailed design,
2. fit the majority of State facilities known at the time,
3. assist the other States in choosing their computer facilities, and
4. aid in planning special arrangements for those States that could not meet the minimum hardware configuration.

The minimum hardware configuration consists of:

Mainframe:	Byte oriented, medium to large scale, IBM 360/50 and up or IBM 370/145 and up, or word oriented equivalent
Operating System:	OS type (MFT, MVT, VS1 or VS2)
Main Storage:	512K bytes of which 150K bytes are accessible by a user program
Peripherals:	3 tape drives and 3 disc spindles at any one time
Software:	ANS COBOL compiler, utilities; and sort/merge

OWS approved the minimum hardware configuration, permitting further detailed design.

Volume I, Unit 1

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
11	5		Discussion
12	10	I.1.E3 I.1.A3	Exercise
13	10		Summary

Instructor Notes

Answer questions; lead class discussion.

After all have filled out their exercises, ask for correct answers. Discuss answers and questions.

Summarize main points of this Unit.

UNIT 2: GENERAL FEATURES OF MSIS

Goal:

To give the trainees a basic understanding of MSIS

Behavioral Objectives:

1. Explain the difference between on-line and batch processing.
    a. Condition: From recall
    b. Accuracy: 80%
    c. Method: Written exercise
2. List the basic services which MSIS provides.
    a. Conditions: From recall
    b. Accuracy: 75%
    c. Method: Written exercise
3. Name the nine subsystems of MSIS.
    a. Condition: From recall
    b. Accuracy: 100%
    c. Method: Written exercise
4. Name at least one function for each subsystem.
    a. Condition: Using the list of subsystems plus recall
    b. Accuracy: 100%
    c. Method: Written exercise

SEQUENCE OF EVENTS: VOLUME I, UNIT 2

TIME	ACTIVITIES
15	Introduction of Unit
10	Data Processing Jargon
30	Slides/lecture: MSIS Design and Services
10	Discussion
10	Exercise
40	Slides/lecture: MSIS Subsystems
15	Discussion
15	Exercise
15	Summary
10	Post-test
10	Student Certificates

Total Time: 3 hours

Volume I, Unit 2

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
1	15	I.T3L	Slide & lecture: Introduction to Unit
2	10		Data Processing Jargon

Instructor Notes

See Introduction to first Unit of this course, p. 53 .

Discuss each slide; give examples often. If possible, show examples of magnetic tape, etc. These terms are used in all MSIS courses.

Data processing terms are necessary to describe the Model State Information System. Look up the following terms in the Glossary, Part IV.

(Computer) Program

(Computer) System

Data Element

File

Hardware

Input

Internal

Magnetic disc

Magnetic tape

Output

Random (direct) access

Record

Report

Sequential access

Software

Subsystem

Table

Turn-around document

Volume I, Unit 2

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
3	30	I.1.S19 I.2.S6	Slides & lecture: MSIS Design . Section 142.15

Instructor Notes

See **p. 145**,Part IV for detailed information.

Purpose.

The Model State Information System meets the federal reporting requirements enumerated in Section 142.15, Reports by States, of the National Interim Primary Drinking Water Regulations. Those requirements are:

§ 142.15 Reports by States.	Requirement Number
Each State which has primary enforcement responsibility shall submit to the Administrator the following information:	
(a) Additions or corrections to the State's inventory of public water systems, as such additions or corrections are made if feasible, and in any event by January 1 of each year.	1
(b) An annual report to be submitted by January 1 of each year, covering the preceding Federal fiscal year ending September 30 of each year, and consisting of:	
(1) A summary of violations by public water systems in the State of the primary drinking water regulations and of enforcement actions taken by the State;	2,3
(2) A summary of the status of each variance and exemption granted by the State which was in effect during any part of the calendar year.	4
(c) Prompt notification of the granting of a variance or exemption. The notice shall include a statement of reasons for the granting of the variance or exemption, including support for the need for the variance or exemption and for the finding that the granting of the variance or exemption will not result in an unreasonable risk to health. A single notification statement may be used to report two or more similar variances or exemptions.	5
(d) The annual report submitted pursuant to paragraph (b) of this section shall be made available by a State to the public for inspection at one or more locations within the State.	

In order to prepare four of the five required federal reports, MSIS maintains records on public water systems and on the quality of the drinking water they supply. MSIS cannot fulfill requirement 142.15c; each State submits the "prompt notification" separately.

Volume I, Unit 2

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
3, con't			Slides & lecture: MSIS Design .Batch system .MSIS Services

Instructor Notes

Batch Computer System.

MSIS is a computer system. It operates in batch mode, which means that batches of data are input weekly or monthly. The opposite of batch mode is on-line or real-time, which means that data are input hourly, or more frequently. MSIS was designed as a management information system. Its records, though, are only as current as the reports made by the PWS and the entering of information from those reports into the system. Since a PWS must report to the State within a general period of 40 days (Section 141.31), the system is not intended to be used for providing yesterday's results. Also, it is not intended to provide the first notification of a violation. A violation must be reported by a PWS to the State within two days. Therefore, a PWS will (if in compliance with the regulations) report a violation to the State before the MSIS will.

MSIS Services.

Basically, MSIS does two things. It keeps records and makes reports. MSIS can provide States with these specific benefits:

1. Significantly reduce costs of implementing the new Regulations by using a centrally-developed MSIS computer system (funded by OWS).

2. Give States local control of MSIS by operating it on a computer facility of the State's choice.

3. Produce annual reports which comply with four of five federal reporting requirements.

4. Produce reports which comply with State regulations.

5. Provide positive control over local water suppliers' sampling, using optional sample scheduling and audit trails.

6. Optimally utilize scarce technical personnel through priority targeting of State Sanitary Surveys.

7. Automatically monitor compliance schedules under variances and exemptions and tracking of enforcement actions.

Volume I, Unit 2

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
3, con't			Slides & lecture: MSIS Design . Base vs. optional subsystems

Instructor Notes

Base vs. Optional Subsystems

Some of the MSIS services are directly provided by the nine subsystems, which are:

1. Public Water System Inventory
2. Water Quality Compliance
3. Regulations
4. Federal Reporting
5. Standard Processing
6. Variances and Exemptions
7. Enforcement Actions
8. Sanitary Survey
9. Operator and Mailing

The first five subsystems (Public Water System Inventory, Water Quality Compliance, Regulations, Federal Reporting, and Standard Processing) comprise the basic package, which is required if any portion of the MSIS is to be used. States may select the base package and one or more optional subsystems, depending on their volume of data and individual needs. Most States have chosen all nine subsystems.

States not selecting Variances and Exemptions or Enforcement Actions must prepare required federal reports by themselves.

Volume I, Unit 2

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
4	10		Discussion
5	10	I.2.E1 I.2.A1	Exercise

Instructor Notes

Answer questions.

After all exercises are filled out, verbally give correct answers. Discuss class answers.

Volume I, Unit 2

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
6	40	I.2.S6	Slides & lecture: The nine MSIS subsystems, their functions and computer programs. . REGS . PWSI . WAQC

Instructor Notes

See p. 145 Part IV for detailed information.

The functions of each subsystem, and the purpose of its major computer programs, are:

Subsystem Name	Function, programs
Regulation (REGS)	REGS maintains a computer version of current federal regulations and of all State regulations that are no less stringent. REGS has two computer programs which provide: a. a means of establishing a computer version of the State and federal regulations, and b. a printed image of the computer version.
Public Water System Inventory (PWSI)	PWSI maintains descriptive data on each PWS in the State, such as name, address, production capacity, and water sources. All community PWS's must be entered in PWSI immediately for monitoring. Since monitoring of the quality of water supplied by non-community PWS's begins two years after the effective date of the NIPDWR, their descriptive data may or may not yet be part of PWSI as the State determines. PWSI has 11 computer programs which: a. convert the National Inventory File to a PWSI file, b. permit adding, changing, and deleting records, and c. print several schedules as well as "on-demand" reports.
Water Quality Compliance (WAQC)	This is the heart of MSIS, for it keeps records of analytical results, compares them with the REGS to determine violations, and schedules future sampling for PWS's according to the requirements in the regulations. MSIS reports three

Volume I, Unit 2

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
6, con't			Slides & lecture: The nine MSIS subsystems, their functions and computer programs. . WAQC (con't) . FEDR . MSIS . ENAC

WAQC, con't

types of PWS violations: (1) MCL, (2) sampling procedures and (3) reporting by the PWS to the State.

WAQC consists of 36 programs, 19 of which create reports necessary to monitor a PWS's reports on operation, sampling, and water quality. This subsystem prepares one of the three reports required to be made available by the State to the public.

Federal Reporting (FEDR)

FEDR prepares machine-readable output that is used to satisfy three of the federal reporting requirements in Section 142.15.

Its two computer programs prepare:

1. Changes to the public water inventory (data obtained from PWSI),
2. Summary of variances and exemptions (data obtained from VAEX), and
3. A summary of federal violations (data obtained from WAQC).

Standard Processing (MSIS)

Note: Don't confuse this MSIS subsystem with the overall system.

MSIS has 5 computer programs which perform functions for the other subsystems which occur frequently, such as keeping history records and printing error reports.

Enforcement Actions (ENAC)

ENAC, an optional subsystem, maintains records on the actions taken by the State to enforce the Act when violations have been identified. It provides the fourth report required by Section 142.15, enforcement actions taken.

ENAC contains four programs which:
a. create and maintain the enforcement actions file,
b. select records for printing reports,

Event No.	Time (In min.)	Support Form No.	Event & Method
6, con't			Slides & lecture: The nine MSIS subsystems, their functions, and computer programs. . ENAC, con't . VAEX . SRVY

Instructor Notes

ENAC, con't	and c. print two kinds of reports. Recall that of the five reporting requirements, four are met by MSIS. This subsystem prepares one of the three reports required to be made available by the State to the public.
Variances and Exemptions (VAEX)	VAEX is an optional subsystem which maintains records of variances and exemptions granted by the regulations. VAEX provides the information on variances and exemptions to FEDR for preparation of the related required federal report. VAEX also prepares one of the three reports required to be made available by the State for public inspection. VAEX has six computer programs which maintain records and print scheduled and "on-demand" reports.
Sanitary Survey (SRVY)	SRVY, an optional subsystem, provides a computer technique for selecting PWS's for sanitary surveys required in the regulations. The technique utilized State ranking of five criteria: . PWS type (community or non-community) . Size of population served . Compliance history . Period since last survey, and . Type of water source SRVY has two computer programs which: a. rank each of the PWS according to the State's priority for the above five criteria, b. select a State-specified number of PWS off the top of the list, and c. print those records selected on a report.

Volume I, Unit 2

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
6, cont			Slides & lecture: The nine MSIS subsystems, their functions, and computer programs. . OPER

Instructor Notes

Operator and Mailing (OPER)	OPER, an optional subsystem, maintains a file of names and addresses of operators and other groups. It will produce mailing labels and lists when required.

Volume I, Unit 2

Detailed Sequence of Events

Event No.	Time (In min.)	Support Form No.	Event & Method
7	15		Discussion
8	15	I.2.E2 I.2.A2	Exercise
9	15		Summary
10	10	I.2.T1	Post-test
11	10		Student Certificates

Instructor Notes

Review all material carefully with trainees. Have a list of questions ready as well as answering those from class.

Hand out exercise; allow 10 minutes to fill out. Pass out answer sheet, then discuss answers.

Summarize major points of this unit.

Hand out post-tests; collect when all are completed.

During the lunch break, have completed student certificates with student name clearly printed, and signed by the Senior Instructor with today's date. Call each person by name and either call to front of room or give out. DO NOT PASS THEM OUT IN A GROUP; give to each individual.

UNIT 3: OPTIONAL MATERIAL

(To be inserted as required).

11B1
(1-4)

MSIS BACKGROUND INFORMATION

Name: ______________________________ Postal Code: ____ Date: / / / / / ______________
(5) (30) (31-32) Month Day Year
(33-38)

1. Circle which MSIS training courses you have already taken:

   (39) a. None. Go to question 2.

   (40) b. MSIS Overview

   (41) c. MSIS Subsystems

   (42) d. Data Entry

2. Have you filled out one of these MSIS Background Information forms before?

   (43) ___ Yes. Thank you for the data; go to the Pre-test.

   (44) ___ No. Go to question 3.

3. Age: ____ years (45)

4. Sex: ___M (46) ___F (47)

5. What was the highest level of schooling you attained? (circle one)

   9 10 11 12 — High School (48)
   13 14 15 16 — College (49)
   M.A./M.S. (50)
   Ph.D. (51)

   Other (please specify) ______________________________ (52-76)

6. Specify your major where appropriate:

   __________ College (77)
   __________ M.A./M.S. (78)
   __________ Ph.D. (79)
   __________ Other (80)

11B2
(1-4)

7. What is your job title?______________________________
(5) (30)

8. How long have you held your present position?___years ___ mont
(31) (32)

9. How many years experience do you have in the general area of your present job position?

____
(33) (34)

10. Have you had training related to your present position in the past two years (other than the present MSIS training)?

(35)___No. Go to question 11.

(36)___Yes. Please answer the following:

a. What was the subject?______________________________
(37) (51)

b. What was the length of training?______________________
(52) (55)

c. Who offered the training?__________________________
(56) (65)

d. Rate your knowledge resulting from the training.

(66) None (67) A little (68) Some (69) Quite a bit

(70) Great deal

11. Please rate your current knowledge level of data processing (circle the appropriate answer).

(71) None (72) A little (73) Some (74) Quite a bit

(75) Great deal

12. Please rate your current knowledge level of the Federal Regulations pertaining to Safe Drinking Water Act of 1974 (circle the appropriate answer).

(76) None (77) A little (78) Some (79) Quite a bit

(80) Great deal

Thank you for your cooperation.

I.1.T1
11T1
(1-4)

PRE-TEST

MSIS OVERVIEW

Name: ________________________________ (5) (30)

Postal Code ______ (31-2)

Date ___/___/___ Month Day Year (33-8)

1. Circle the purpose of the Safe Drinking Water Act:

   (39) a. Monitor drinking water quality
   (40) b. Assure the public is provided with safe drinking water
   (41) c. Report to the federal government drinking water quality

2. Circle the four primary contaminant categories named in the act:

   (42) a. Chemical
   (43) b. Taste
   (44) c. Physical
   (45) d. Metaphysical
   (46) e. Odor
   (47) f. Biological
   (48) g. Radiological

3. Circle T (True) or F (False) for the following statements:

   T F (49) MSIS is a batch computer system.

   T F (50) The Regulations define a public water system (PWS) as a water system supplying drinking water for human consumption to at least 15 service connections or 25 individuals daily for at least 120 days per year.

   T F (51) Newly granted variances and exemptions must be reported annually by the State to EPA.

   T F (52) Additions and corrections to the State's PWS inventory must be reported by the State annually to EPA.

   T F (53) A summary of enforcement actions is reported promptly by the State to EPA.

   T F (54) MSIS was developed as a centralized system.

4. Circle the appropriate answer:

Which of the following is a basic service of MSIS?

(55) a. On-line laboratory analysis
(56) b. Sampling water
(57) c. Analyzing sanitary survey results
(58) d. Keeping records

5. Circle the following abbreviations which are names of MSIS subsystems:

(59) a. REGS
(60) b. TURB
(61) c. FEDR
(62) d. BIPS
(63) e. CMCL
(64) f. WAQC
(65) g. VAEX
(66) h. QUAL
(67) i. ENAC

6. Rate your current level of knowledge about MSIS:

(68) None
(69) A little
(70) Some
(71) Quite a bit
(72) A great deal

I.1.C1

Today's Agenda	Date	Time
Warm-up		
Pre-Test		
Unit I		
Break		
Unit I (con't)		
Lunch		
Unit II		
Break		
Unit II (con't)		
Post-test		
Student certificates		

Volume I
MSIS Overview

Unit I
Safe Drinking Water Act
Regulations
Development of MSIS
Unit II
MSIS Features

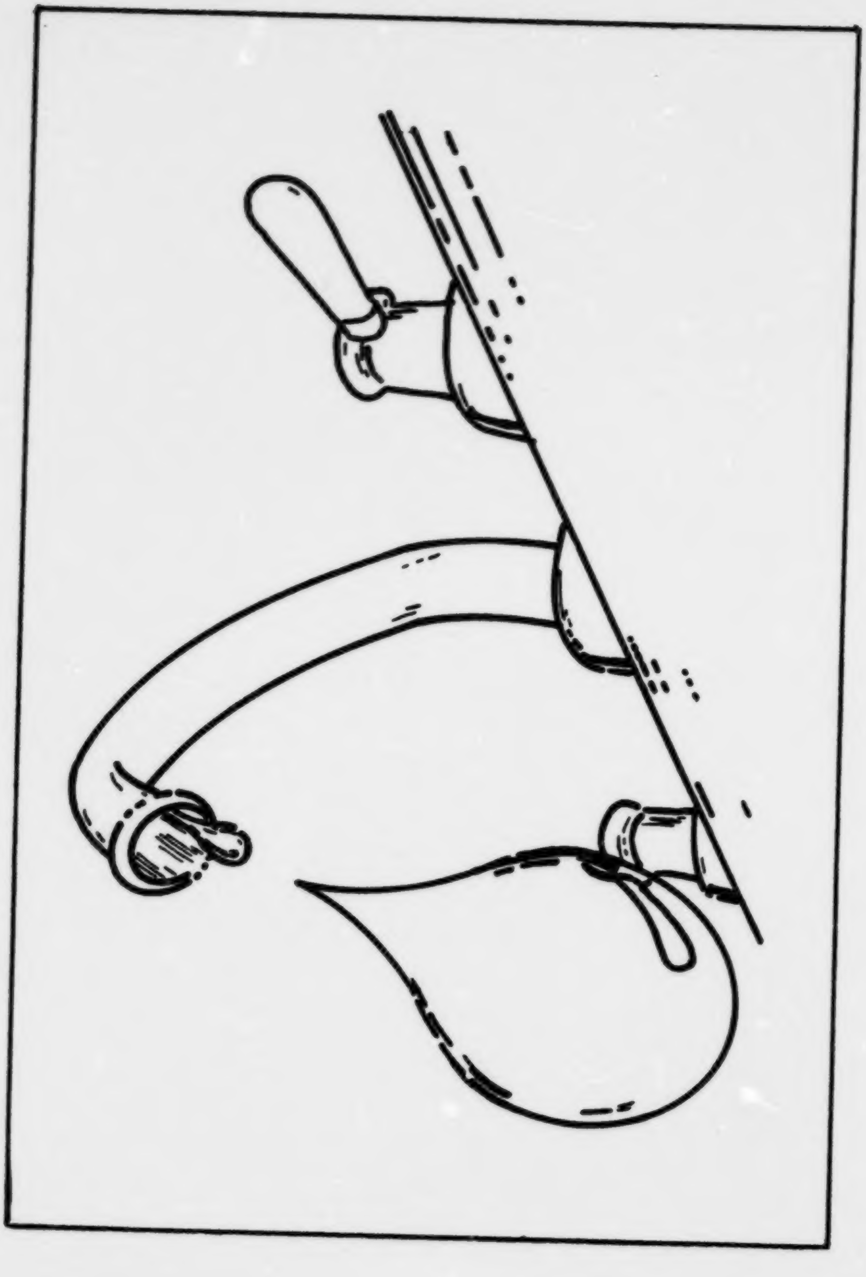
Safe Drinking Water Act (SDWA) defines:

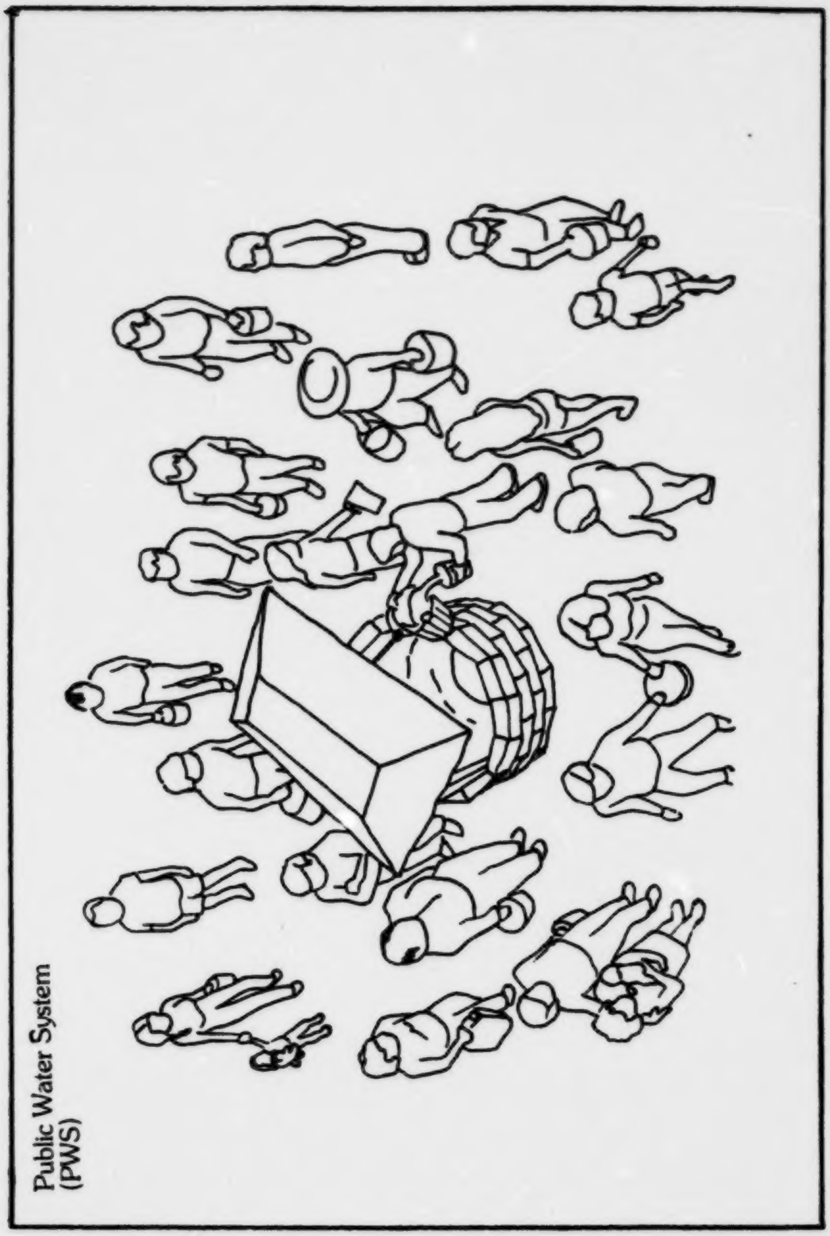
- Public Water System (PWS)
- Contaminants
- Maximum Contaminant Level (MCL)
- Regulations needed
  Primary
  Secondary

Safe Drinking Water Act (SDWA) specifies:

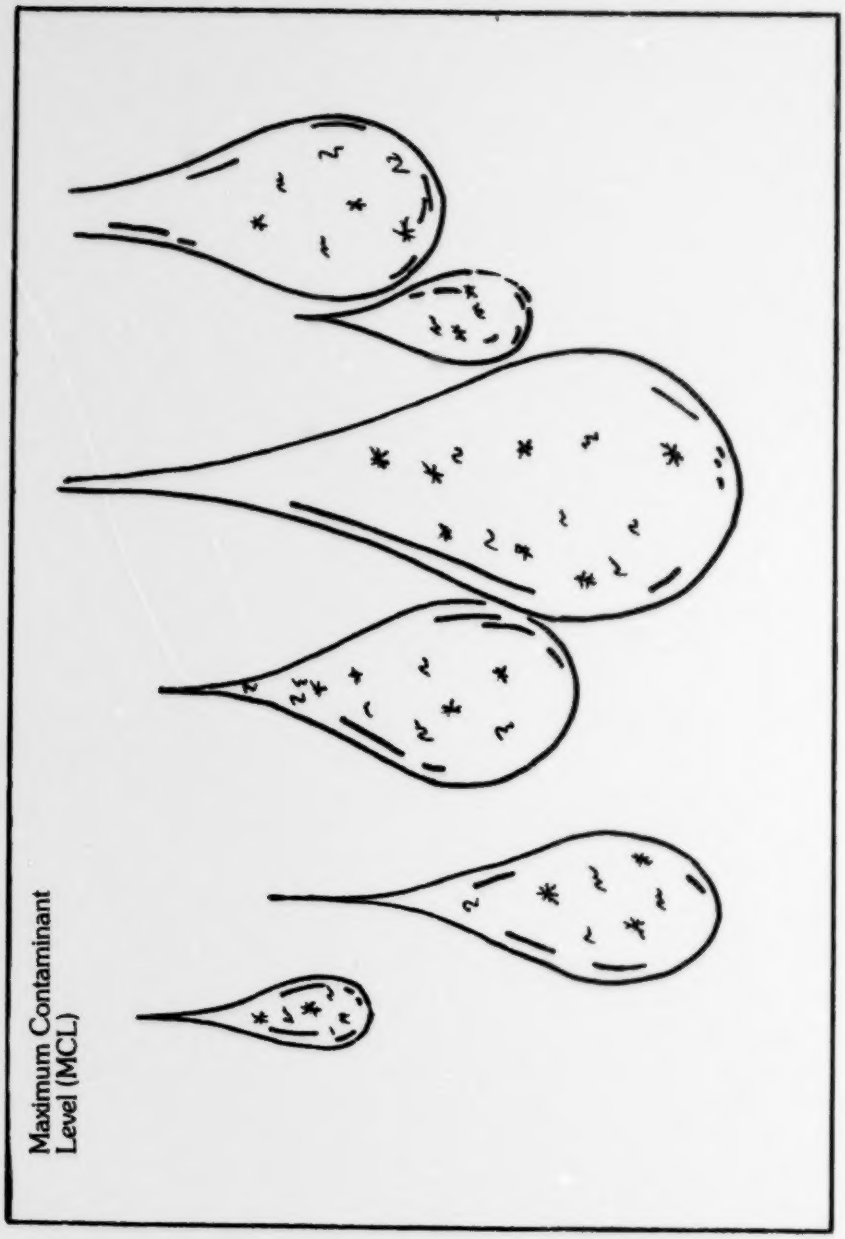
- EPA development of regulations
- State primacy requirements
  state regulations
  enforcement procedures
  record keeping
  federal reporting
  variances and exemptions
  emergency provisions

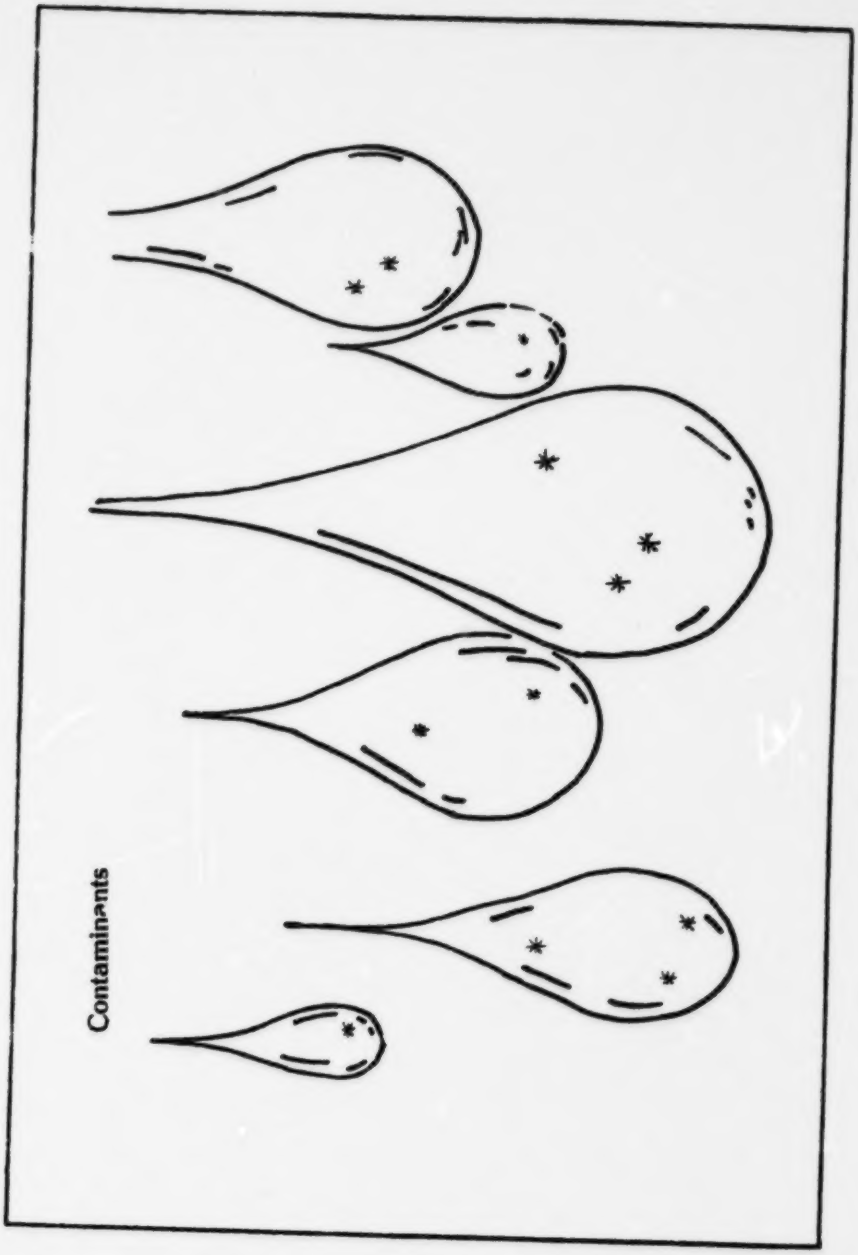
I.1.S2

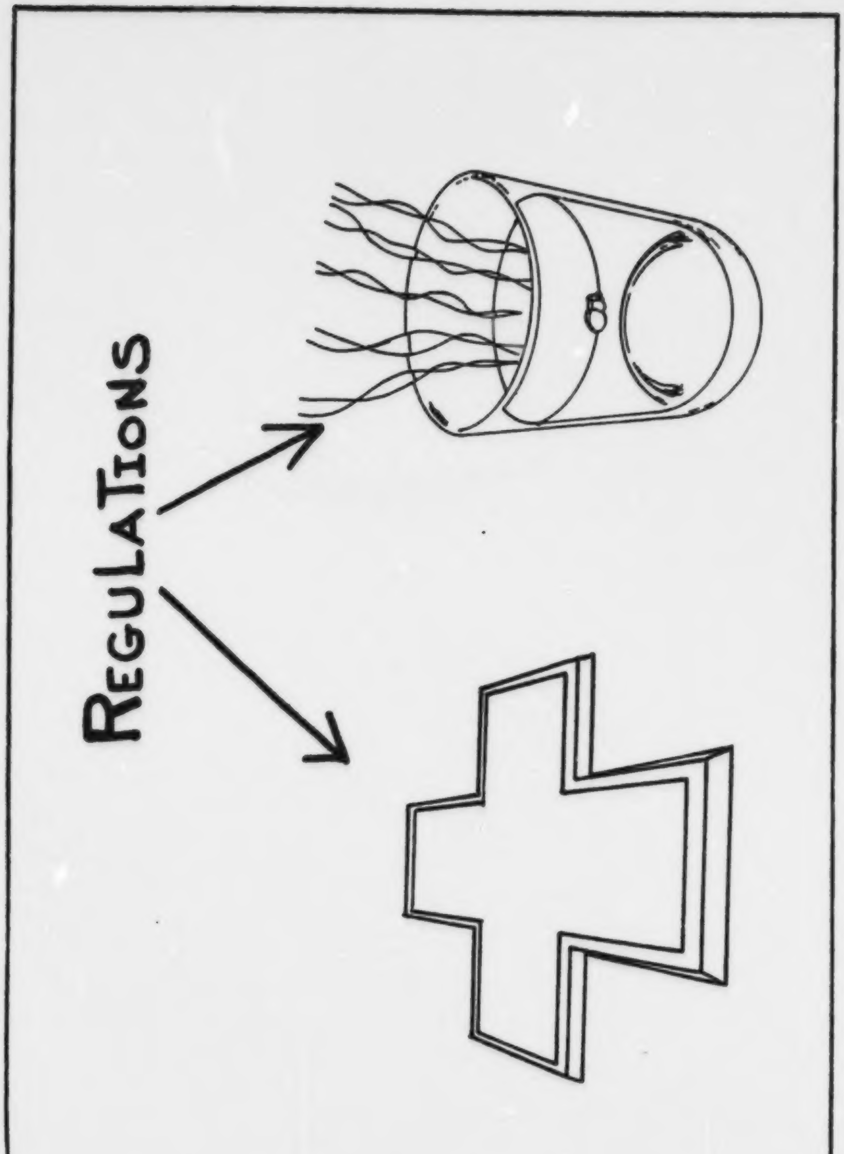


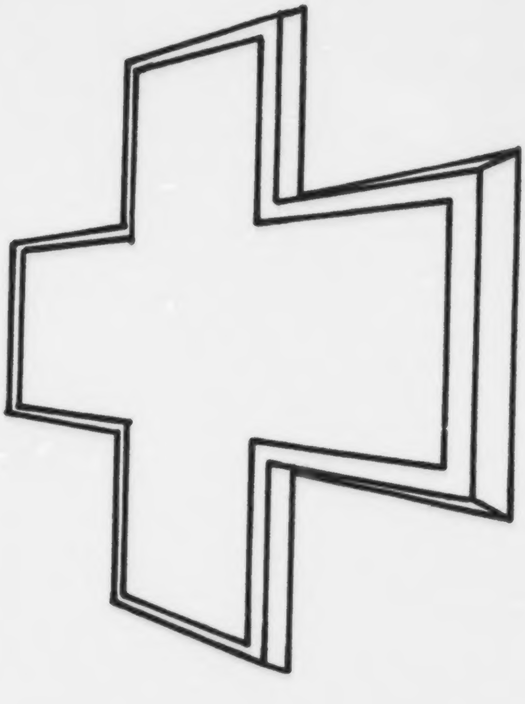


Public Water System
(PWS)


Maximum Contaminant Level (MCL)

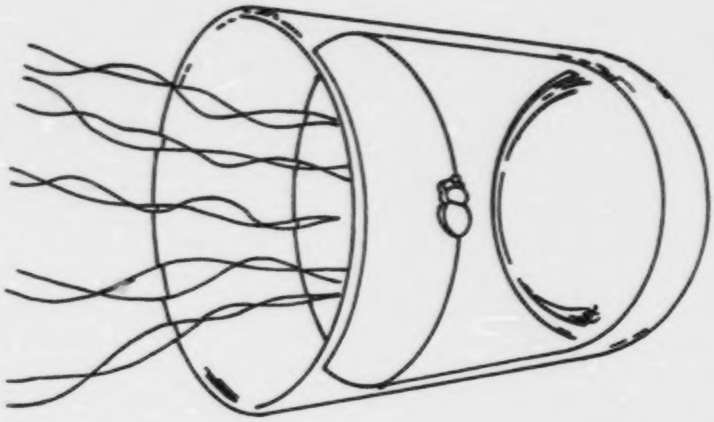

Contaminants


REGULATIONS



Primary Regulations

Secondary Regulations



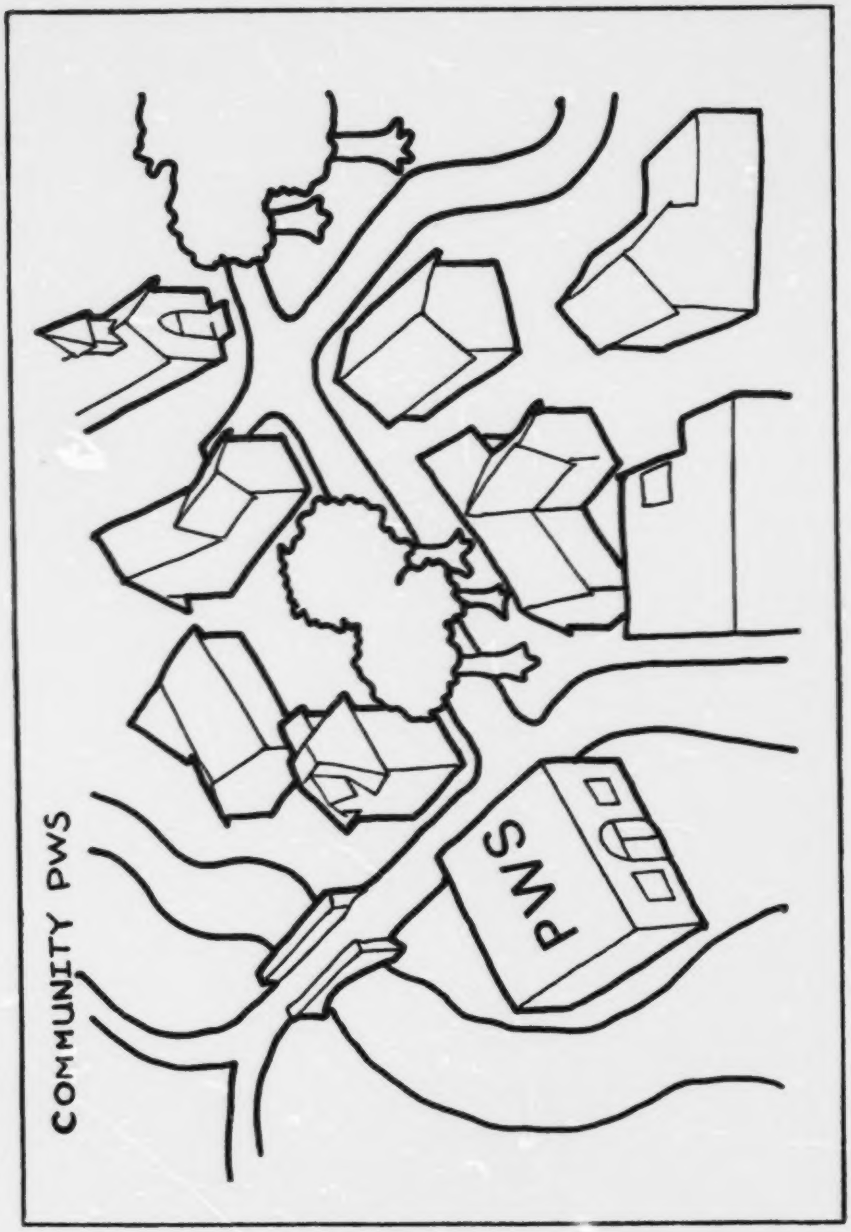
Regulations

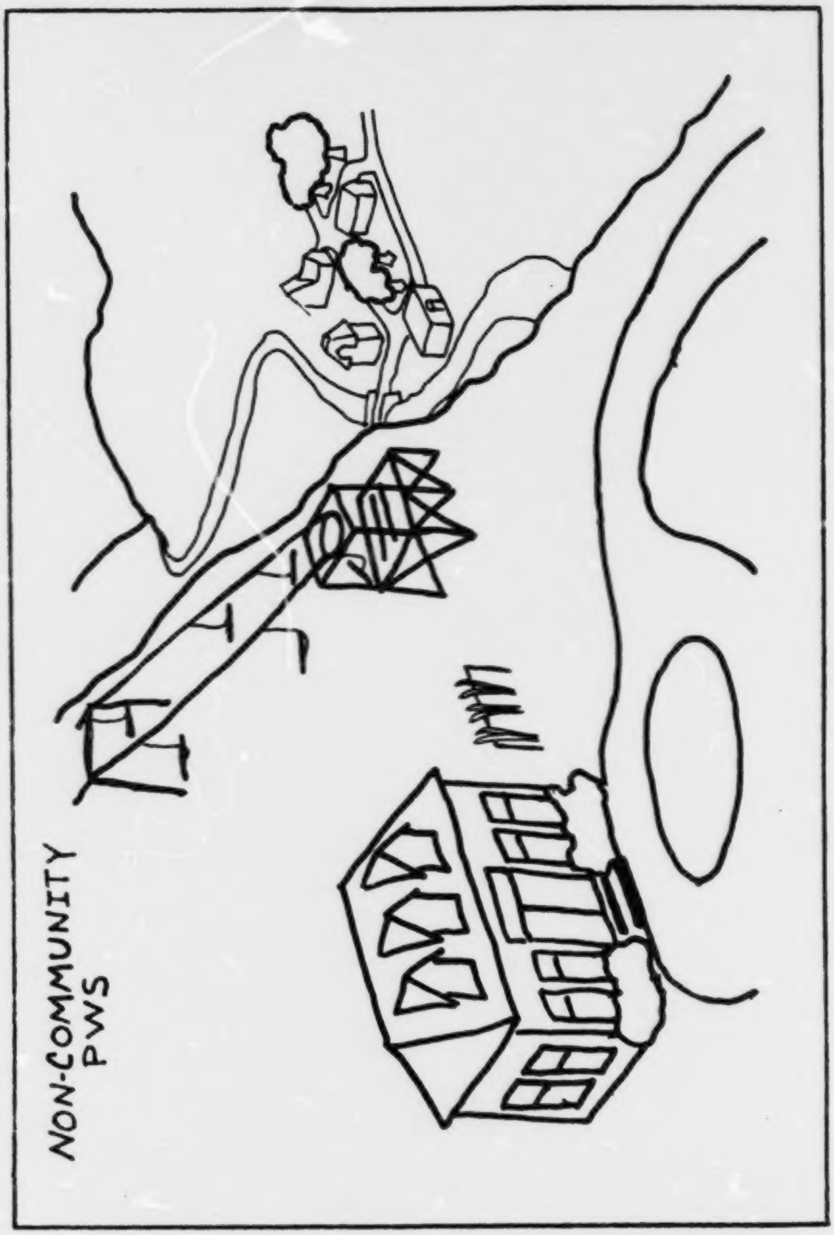
- Define Public Water System (PWS)
- Establish monitoring requirements
- Establish state reporting requirements
- Establish federal reporting requirements

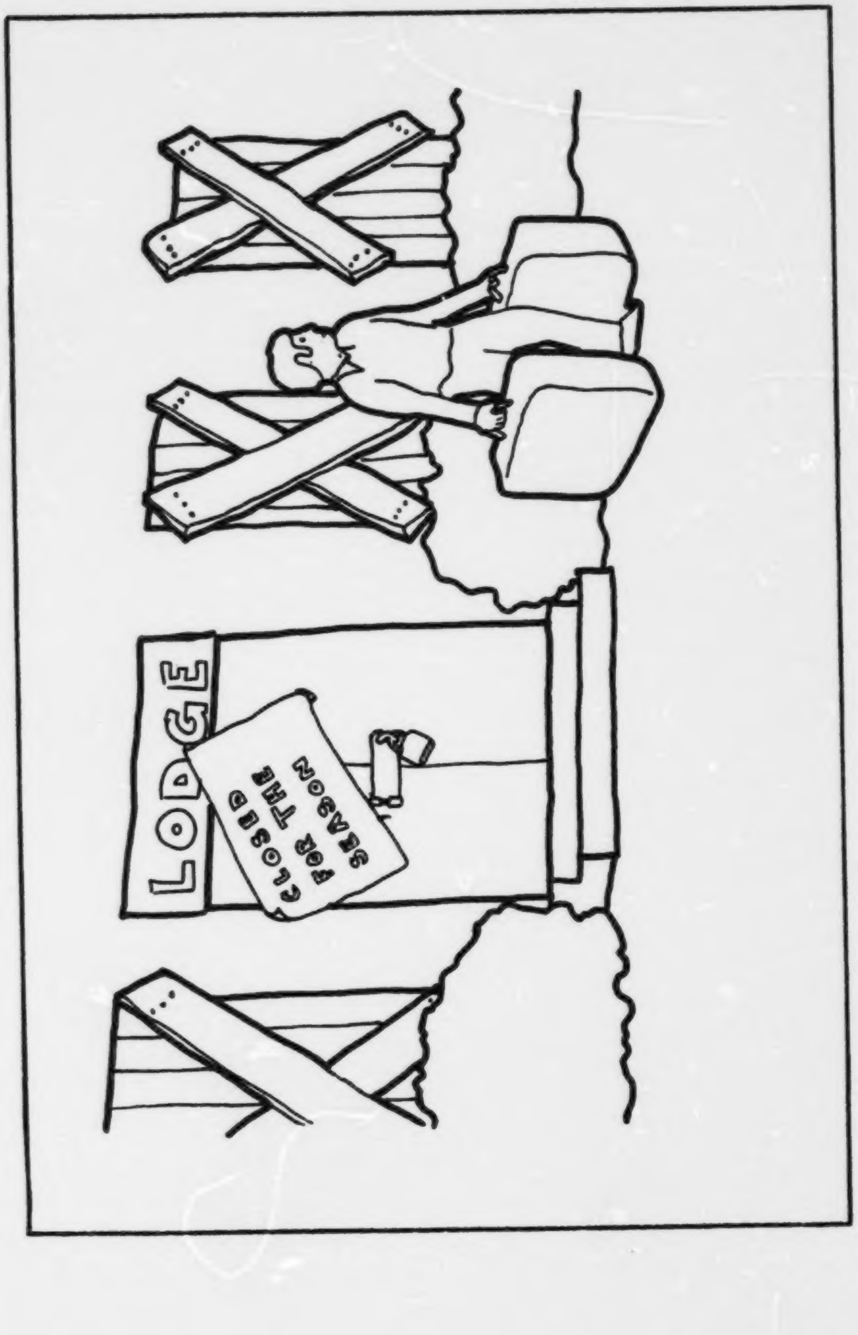
- **Establish monitoring requirements**
  - contaminants
  - maximum contaminant levels (MCL)
  - sampling rates
  - analysis techniques

- **Contaminants**
  - Microbiological
  - Inorganic chemical
  - Organic chemical
  - Physical
  - Radiological

- **Contaminants**
  - *Microbiological:*
    - *coliform bacteria*


COMMUNITY PWS
PWS


NON-COMMUNITY
PWS


LODGE
CLOSED FOR THE SEASON

- **Contaminants**
  Organic chemical:
    endrin, lindane,
    methoxychlor,
    toxaphene,
    2,4-D, and
    2,4,5-TP silvex

- **Contaminants**
  Radiological:
    Gross Alpha
      radium 226
      radium 228
    Gross Beta

- **Contaminants**
  Inorganic chemical:
    arsenic, barium,
    cadmium, chromium,
    fluoride, lead,
    mercury, nitrate,
    selenium, and silver

- **Contaminants**
  Physical:
    turbidity

Safe Drinking Water Act
(SDWA)
↓
National Interim Primary
Drinking Water Regulations
(regulations)
↓
Model State
Information System
(MSIS)

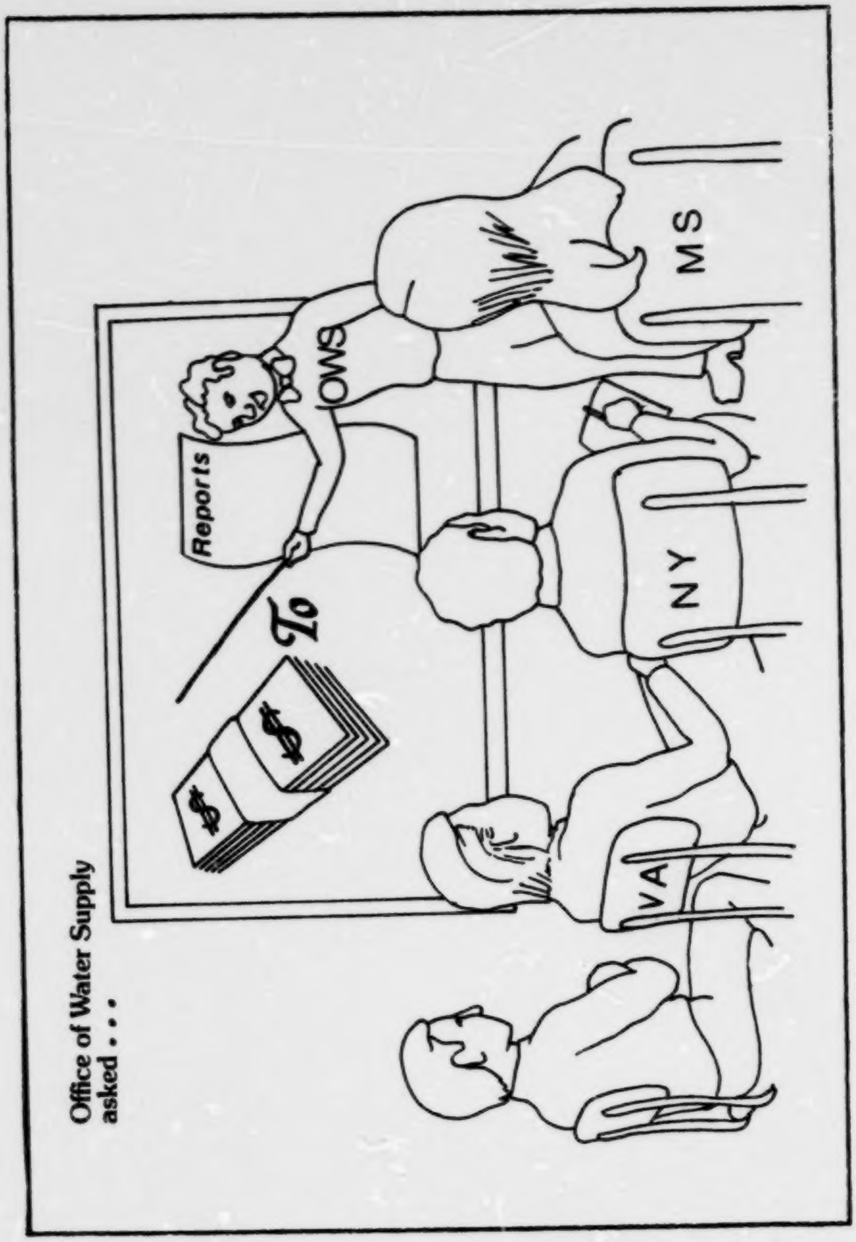
Establish federal reporting requirements

Update of Public Water System Inventory (PWSI)
Summary of PWS violations
Report of State enforcement actions
Variances and exemptions granted

AMS Feasibility Study

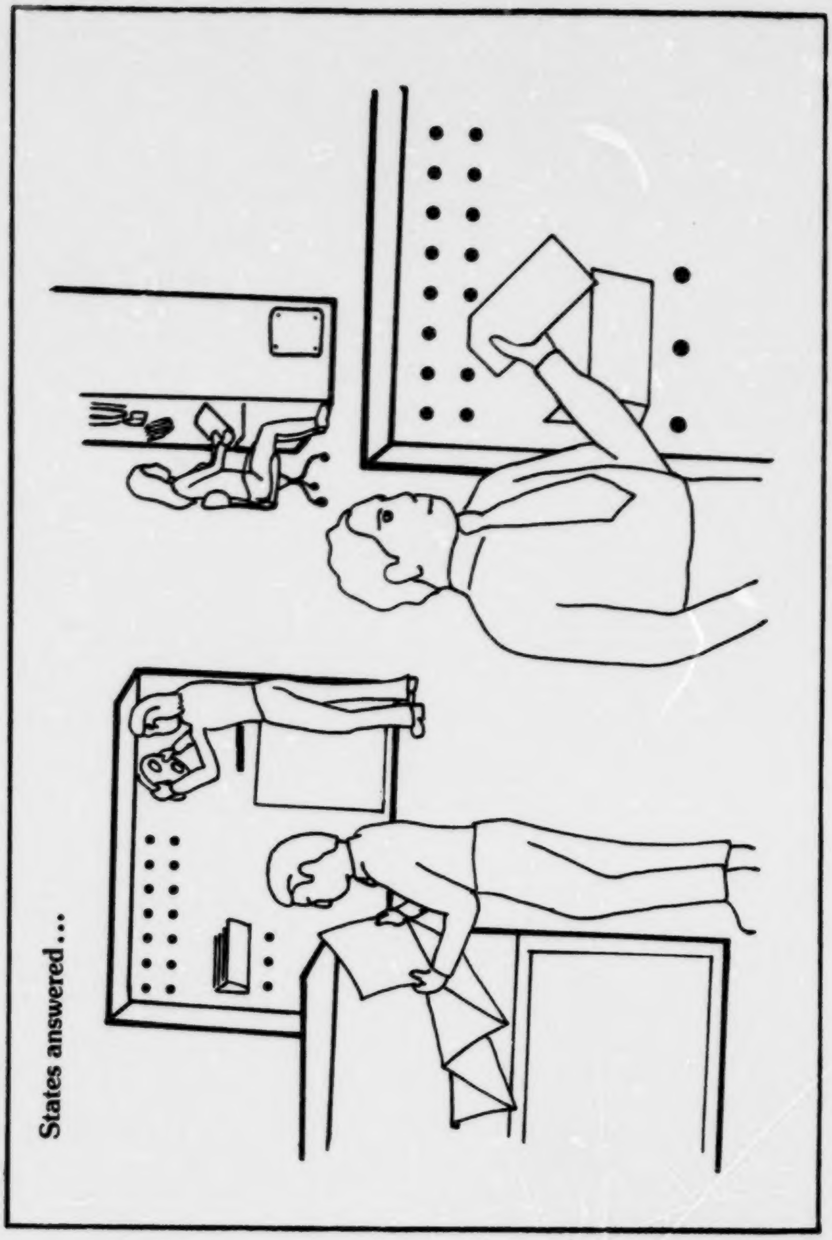
- Centralized system at EPA
- Centralized system with existing software
- Decentralized system

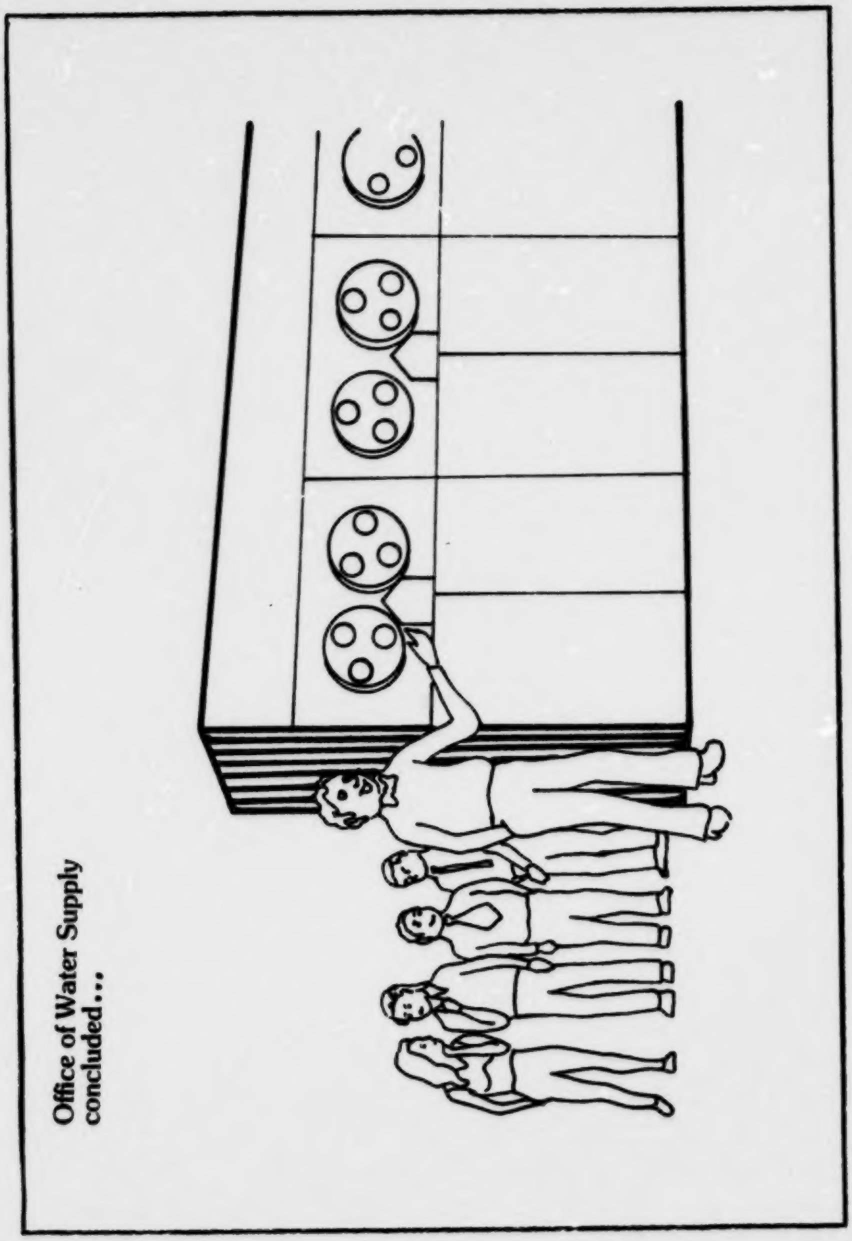
- **Decentralized system**
  States choice
  More economical
  State content of data
  State modifications



Office of Water Supply asked . . .

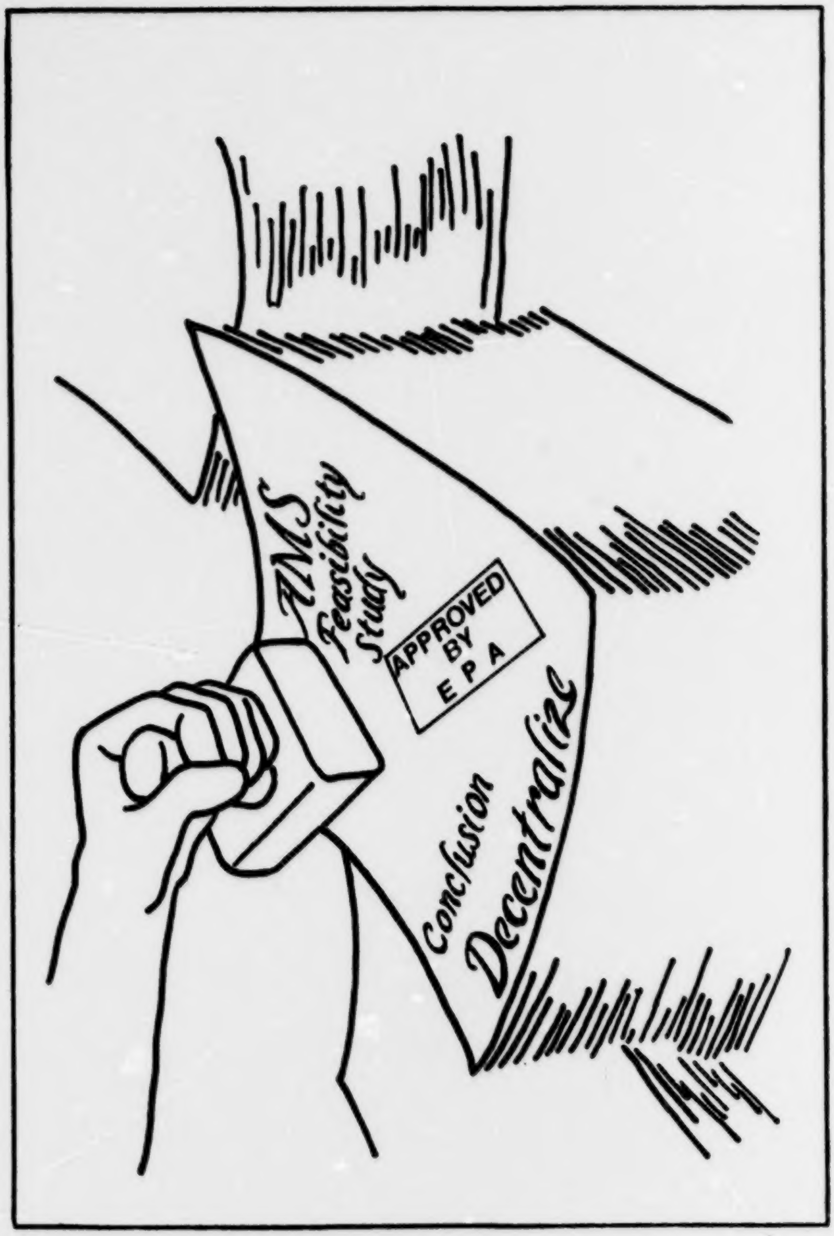
$
$
To
Reports
OWS
VA
NY
MS


States answered...



Office of Water Supply concluded...

I.1.S18

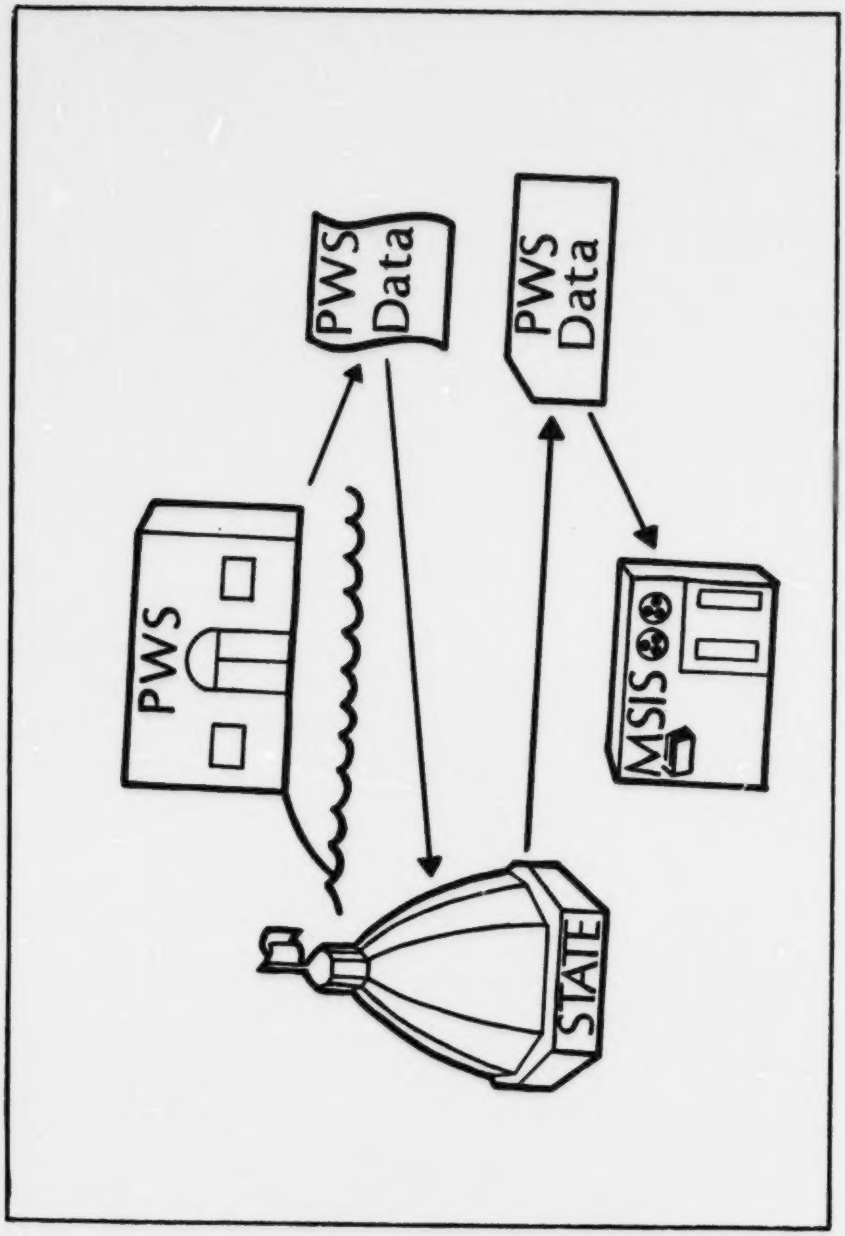

FMS
Feasibility
Study
APPROVED
BY
E P A
Conclusion
Decentralize

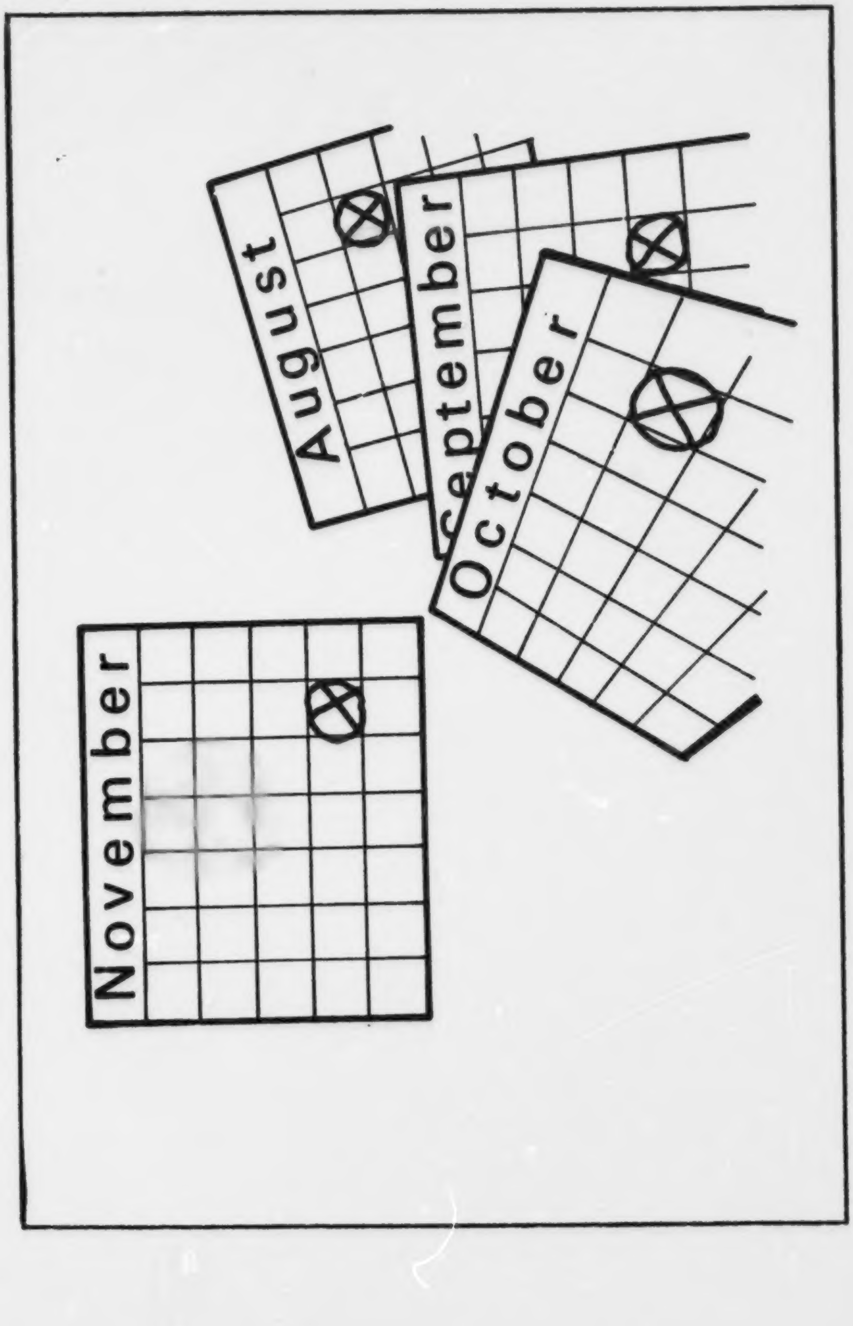
AMS design
- Conceptual design
- Computerized counterpart

- **Detail system design**
- **Installation planning**

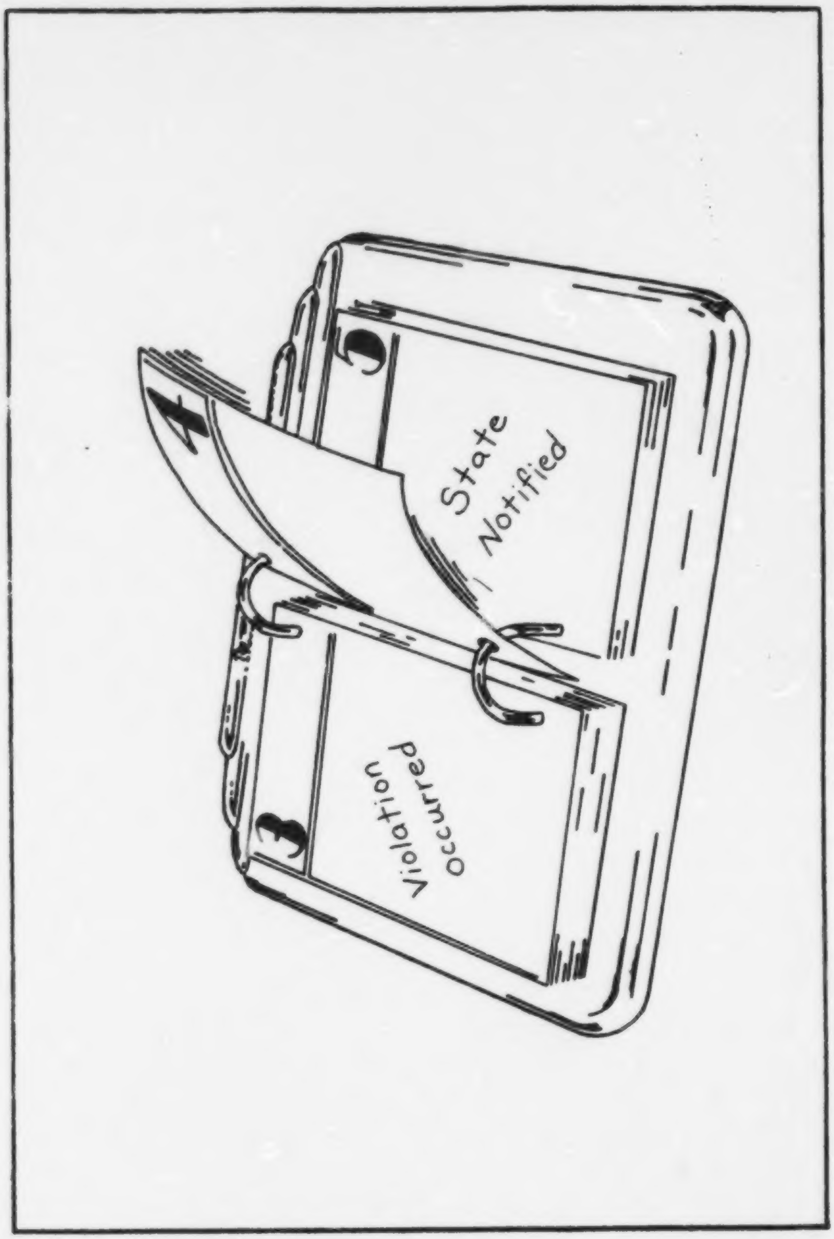
- **General Design**
  Management Information
  System
  System Design

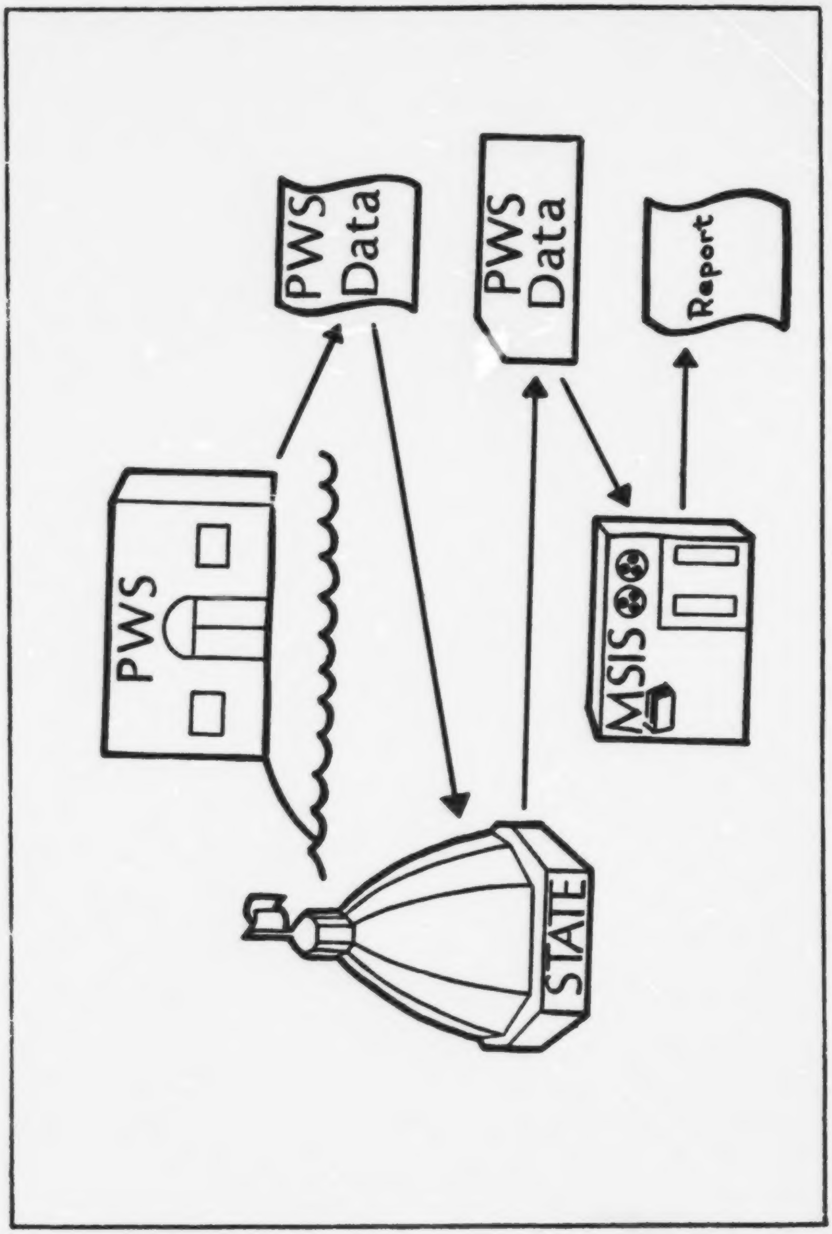
MSIS Subsystems
- Regulations (REGS)
- PWS Inventory (PWSI)
- Water Quality Compliance (WAQC)
- Federal Reporting (FEDR)
- Standard Processing (MSIS)
- Variances and Exemptions (VAEX)
- Enforcement Actions (ENAC)
- Sanitary Survey (SRVY)
- Operator and Mailing (OPER)

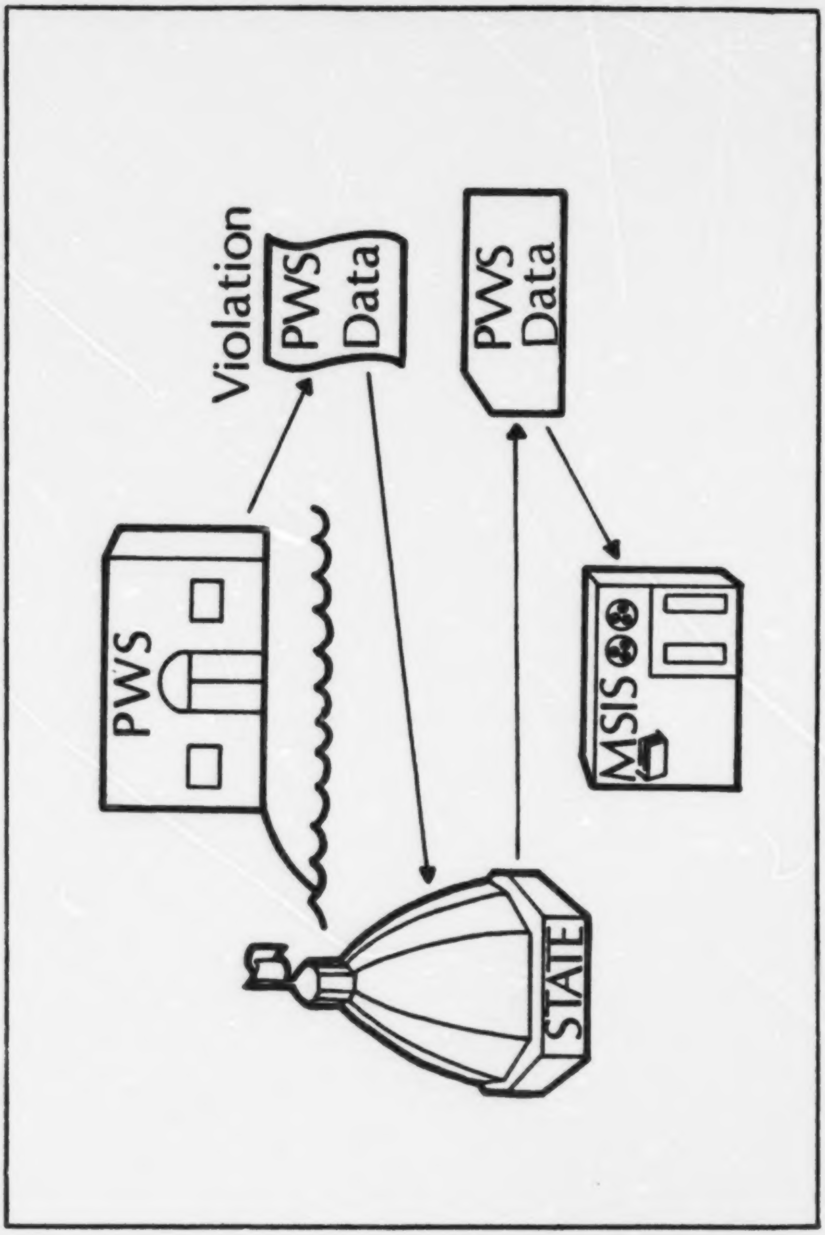

PWS
PWS Data
PWS Data
STATE
MSIS


August
September
October
November

I.2.S3


3
Violation occurred
4
3
State Notified


PWS
PWS Data
STATE
PWS Data
MSIS
Report


PWS
Violation
PWS
Data
PWS
Data
STATE
MSIS

MSIS Subsystems:
- **Base**
- **Optional**

MSIS Base Subsystems
- Regulations (REGS)
- PWS Inventory (PWSI)
- Water Quality Compliance (WAQC)
- Federal Reporting (FEDR)
- Standard Processing (MSIS)

MSIS Optional Subsystems
- Variances and Exemptions (VAEX)
- Enforcement Actions (ENAC)
- Sanitary Survey (SRVY)
- Operator and Mailing (OPER)

I.1.E1

Safe Drinking Water Act

1. Define:

   Contaminant - ______________________________

   Public Water System - ______________________________

   Maximum Contaminant Level (MCL) - ______________________________

2. State the four conditions a PWS must meet to be excepted from the regulations. ______________________________

3. What are the three main differences between a variance and an exemption?

   ____

4. What requirement of the Safe Drinking Water Act does MSIS fulfill?

   ____

Regulations

1. Define:

PWS - ______

______

______

______

Community PWS - ______

______

______

______

Non-community PWS - ______

2. List three types of requirements in the regulations that can be violated by a PWS. 1. ______

2. ______

3. ______

3. List the four contaminant categories. 1. ______

2. ______ 3. ______ 4. ______

4. List the five federal reporting requirements of the regulations.

______

______

______

______

______

______

Developing MSIS

1. Name one reason why the federal government developed MSIS for the States.

2. Name at least one reason why the system is decentralized.

MSIS Design and Services

1. Explain the difference between on-line and batch processing. ______________________

2. List the two basic services which MSIS provides.

3. What machine-readable reports does MSIS provide for the States to submit to the federal government? ______________________

MSIS Subsystems

1. Name the nine subsystems of MSIS.

   1. ________________________________
   2. ________________________________
   3. ________________________________
   4. ________________________________
   5. ________________________________
   6. ________________________________
   7. ________________________________
   8. ________________________________
   9. ________________________________

2. Name at least one function for each subsystem.

I.1.A1

Safe Drinking Water Act

1. Define:

   Contaminant - any physical, chemical, biological, or radiological substance or matter in water. (1401.6)

   Public Water System (PWS) - a system for the provision of piped water to the public for human consumption which has at least 15 service connections or regularly serves at least 25 individuals. (1401.4)

   Maximum Contaminant Level (MCL) - the maximum permissible level of a contaminant in water which is delivered to any user of a PWS. (1401.3)

2. State the four conditions a PWS must meet to be excepted from the regulations. 1. consists only of distribution and storage facilities (no collection or treatment facilities), 2. obtains water from another PWS to which the regulations apply, 3. does not sell water, 4. is not a carrier of interstate passengers.

3. What are the three main differences between a variance and an exemption? 1. An exemption applies only to an existing PWS; no exemptions will be permitted to future PWSs. 2. Exemptions are basically granted when a PWS cannot afford generally available treatment techniques, whereas variances are granted when the raw water is unusually poor and the generally available treatment techniques are used and do not reduce the contaminant level below the MCL. 3. An exemption will expire in 1981 and may be renewed for two more years, but a variance has no time limit.

4. What requirement of the Safe Drinking Water Act does MSIS fulfill? It keeps records and provides reports for the federal government.

Regulations

1. Define:

PWS - a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year.

Community PWS - a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

Non-community PWS - all other public water systems.

2. List three types of requirements in the regulations that can be violated by a PWS.

1. Maximum contaminant levels.
2. Monitoring requirements.
3. Reporting to the State.

3. List the four contaminant categories. 1. chemical

2. physical 3. microbiological 4. radiological

4. List the five federal reporting requirements of the regulations.

1. additions or corrections to the State's inventory of PWSs annually.
2. a summary of violations by public water systems, annually.
3. a summary of enforcement actions, annually.
4. a summary of the status of variances and exemptions, annually.
5. the granting of a variance or exemption, promptly.

Developing MSIS

1. Name one reason why the federal government developed MSIS for the States.

   1. the funds for administering the SDWA would be used in a way that the majority of States desired, i.e., to develop a computer system.

   2. the combined funds could develop a better system.

   3. the system would be uniform with standard output to be sent to the federal government.

2. Name at least one reason why the system is decentralized.

   1. it was the States' preferred method.

   2. it would be more economical.

   3. it would give the State more control of the integrity of the data in their system.

   4. it would better assure confidentiality of State data, and

   5. it would allow the State to modify the system for its own individual circumstances.

MSIS Design and Services

1. Explain the difference between on-line and batch processing.

   Batch processing means that batches of data are input weekly or monthly, whereas on-line processing means that data are input hourly or more frequently.

2. List the two basic services which MSIS provides.

   1. It keeps records.
   2. It provides reports.

3. What reports does MSIS provide for the States to submit to the federal government?

   1. additions or corrections to the State's inventory of PWSs of the national primary drinking water regulations.
   2. a summary of violations by public water systems.
   3. a summary of enforcement actions taken by the State.
   4. a summary of the status of each variance and exemption in effect during any part of the calendar year.

MSIS Subsystems

1. Name the nine subsystems of MSIS.

   1. Regulations (REGS)
   2. Public Water System Inventory (PWSI)
   3. Water Quality Compliance (WAQC)
   4. Federal Reporting (FEDR)
   5. Standard Processing (MSIS)
   6. Variances and Exemptions (VAEX)
   7. Enforcement Actions (ENAC)
   8. Sanitary Survey (SRVY)
   9. Operator and Mailing (OPER)

2. Name at least one function for each subsystem.

   REGS maintains a computer version of the federal and State regulations.

   PWSI maintains descriptive data on each PWS in the State.

   WAQC maintains sample and analysis data, determines violations, and schedules sampling.

   FEDR prepares machine-readable output that is used to satisfy three of the federal reporting requirements.

   MSIS performs functions for the other subsystems such as keeping history records and printing error reports.

   ENAC maintains records on the actions taken by the State to enforce the Act when violations have been identified.

   VAEX maintains records of variances and exemptions granted and their status.

   SRVY provides a computer technique for selecting PWSs for sanitary survey.

   OPER maintains a file of names and addresses for producing mailing labels and lists.

I.2.T1
12T1
(1-4)

POST-TEST

MSIS OVERVIEW

Name: ______________________________ Postal Code ______ Date ___/___/___
(5) (30) (31-2) Month Day Year
(33-8)

1. Circle the purpose of the Safe Drinking Water Act:

   (39) a. Monitor drinking water quality
   (40) b. Assure the public is provided with safe drinking water
   (41) c. Report to the federal government drinking water quality

2. Circle the four primary contaminant categories named in the act:

   (42) a. Chemical
   (43) b. Taste
   (44) c. Physical
   (45) d. Metaphysical
   (46) e. Odor
   (47) f. Biological
   (48) g. Radiological

3. Circle T (True) or F (False) for the following statements:

   T F (49) MSIS is a batch computer system.

   T F (50) The Regulations define a public water system (PWS) as a water system supplying drinking water for human consumption to at least 15 service connections or 25 individuals daily for at least 120 days per year.

   T F (51) Newly granted variances and exemptions must be reported annually by the State to EPA.

   T F (52) Additions and corrections to the State's PWS inventory must be reported by the State annually to EPA.

   T F (53) A summary of enforcement actions is reported promptly by the State to EPA.

   T F (54) MSIS was developed as a centralized system.

4. Circle the appropriate answer:

Which of the following is a basic service of MSIS?

(55) a. On-line laboratory analysis
(56) b. Sampling water
(57) c. Analyzing sanitary survey results
(58) d. Keeping records

5. Circle the following abbreviations which are names of MSIS subsystems:

(59) a. REGS
(60) b. TURB
(61) c. FEDR
(62) d. BIPS
(63) e. CMCL
(64) f. WAQC
(65) g. VAEX
(66) h. QUAL
(67) i. ENAC

6. Rate your current level of knowledge about MSIS:

(68) None
(69) A little
(70) Some
(71) Quite a bit
(72) A great deal

MODEL STATE INFORMATION SYSTEM

PART IV

COURSE REFERENCE MATERIAL

GLOSSARY

Terms are included in this glossary only if their meanings differ from those found in a standard English language dictionary.

Analysis:

The separation of any abstract entity or material into its constituant elements, such as chemical-intentionally produced decomposition or separation of materials into their ingredients to find their kind or quality.

Analysis Method:

The method or technique utilized to obtain analysis results.

Analytical Techniques:

The methods used to determine the components of a substance, especially raw water.

Batch Processing:

A procedure in which a number of transactions, for example on keypunched cards, are accumulated before being processed together.

Check Sampling:

The act of acquiring additional quantities of water for analysis over and above the regular samples due to the suspicion of violating maximum contaminant levels.

Code:

A system used for brevity of communication in which arbitrarily chosen words, letters, or symbols are assigned definite meanings.

Computer:

A machine which accepts input data, processes it, and gives output data.

Computer Program:

A sequence of computer-readable instructions used in conjunction with appropriate data to perform specified logical tasks.

Correction:

Additions, subtractions, or changes to a computer file.

Course:

All content taught in one individual MSIS training program volume. A course is subdivided into units.

Data:

Raw facts or statistics which alone have little or no meaning, but as a group allow some meaningful relationships to be drawn.

Data Element:

An identifiable item of information within a record. See the Data Element Dictionary for all data elements used in MSIS.

Data Processing:

The act of manipulating information to obtain a desired result, especially with the use of a computer.

Economical:

Of or pertaining to the financial reasons for granting variances and exemptions.

Enforcement:

The act of creating and maintaining compliance using coercive methods.

Enforcement Action:

An act intended to generate compliance.

Exemption:

Authorized waiver of an MCL requirement due to compelling factors, such as need for a PWS to design and build effective treatment facilities.

Field:

See data element.

File:

A collection of records systematically arranged to facilitate quick reference; may be stored on magnetic tape or magnetic disc.

Goal:

A general achievement toward which effort is directed.

Gross Alpha:

A group of substances which emit Alpha particle radiation.

Gross Beta:

A group of substances which emit Beta particle radiation.

Hardware:

The physical equipment in a data processing system (contrasted with software).

Information:

Data that has been processed to obtain specific results which increase knowledge of the recipient and is used as the basis for decision making.

Inorganic:

Of or pertaining to substances that are not hydrocarbons or their derivatives.

Input:

Information which is specially prepared for acceptance by computer programs. Usually written down on special forms, then put into machine-readable form by, for example, keypunching.

Integrity:

Presumed reliability of data.

Internal:

Data processing occurring within the computer automatically according to instructions from computer programs.

Inventory:

A detailed, descriptive list, for example, of Public Water Systems.

Magnetic Disc:

A device which stores data on the magnetizable surfaces of one or more rotating discs, which look like a stack of phonograph records.

Magnetic tape:

A device which stores data on the magnetizable surface of a long strip of tape (the tape is typically 1 inch wide and 2400 feet long).

Maintain:

Actions taken to ensure up-to-date computer files.

Management Information System:

An organized method of maintaining facts pertinent to the governing of the operations of an organization.

Model State Information System:

(MSIS) a batch computer system designed to (1) maintain records on public water systems and the quality of the water they supply, and (2) prepare reports.

Monitor:

The acts of (1) a PWS observing and checking water quality or (2) a State observing and checking PWSs.

National Inventory File:

A computerized list of many public water systems in the United States; previously used to monitor water quality.

Objective:

A specific achievement that efforts are intended to attain.

Online Processing:

A procedure for inputting data computer whenever needed for immediate data processing, often by typewriter terminal.

Operator:

One who runs a public water system.

Organic:

Of or pertaining to substances that are hydrocarbons or their derivatives.

Output:

Any information passed from the computer.

Primacy:

Primary enforcement responsibility for carrying out the Safe Drinking Water Act of 1974.

Public Water System (PWS):

A set of components for the provision of piped water to persons for human consumption, if such facility has at least fifteen service connections or regularly serves at least twenty-five individuals 60 or more days per year.

Purge:

To remove from a computer those items no longer desired.

Raw Water:

Water at the source before any treatment.

Record:

A logical group of data elements.

Regulations:

Rules created by EPA within the guidelines established by the SDWA and having the same authority.

Report:

Information formatted by the computer in either human-readable form (such as a printed report) or machine-readable form (such as a magnetic tape).

Sample:

A portion of the whole to represent the whole, especially water.

Sanitary Survey:

An on-site review of the water source, facilities, equipment, operation, and maintenance of a public water system for the purpose of evaluating the adequacy of such source for producing and distributing safe drinking water.

Selection Process:

The method used by MSIS for selecting information from a computer file for use in a report. Many different criteria can be used in the selection of the data.

Software:

The computer programs required for the computer to work.

Subsystem:

A subset of the MSIS computer system. There are nine MSIS subsystems.

System:

A method or methods of accomplishing a function or functions, especially with a computer.

Table:

A computer file of brief information usually set up in logical relationships to permit quick access, often on magnetic disc.

Turnaround Document:

A form containing computer-printed information which needs additional information written on it; called "turnaround" since it is both an output and an input.

Unit:

A subset of teaching material within a course.

Variance:

Authorized deviation from an applicable national drinking water regulation because characteristics of the raw water source cannot be corrected by available means.

List of Abbreviations

Abbreviation	Meaning
BIP	Background Informational Package
CVT	Code Value Table
DET	Data Element Table
DVF	Deviations File
EAF	Enforcement Actions File
EMT	Error Message Table
ENAC	Enforcement Actions Subsystem
EPA	Environmental Protection Agency
FEDR	Federal Reporting Subsystem
LBT	Laboratory Table
MCL	Maximum Contaminant Level
MSIS	Model State Information System; also MSIS Standard Processing Subsystem
NIF	National Inventory File
NIPDWR	National Interim Primary Drinking Water Regulations
OMF	Operator and Mailing File
OPER	Operator and Mailing Subsystem
OWS	Office of Water Supply
PSF	Periodic Sample and Analysis File
PWF	Public Water System File
PWS	Public Water System
PWSI	Public Water System Inventory Subsystem
PWT	Public Water System Table
REGS	Regulations Subsystem

RGF	Regulations File
SAF	Sample and Analysis File
SDWA	Safe Drinking Water Act
SHF	MSIS Standard History File
SRVY	Sanitary Survey Subsystem
VAEX	Variances and Exemptions Subsystem
VEF	Variances and Exemptions File
VIF	Violations File
WAQC	Water Quality Compliance Subsystem

ANNOTATED BIBLIOGRAPHY

Bolton, Charles K., and Boyer, Ronald K., One-Way and Two-Way Communication in the Classroom. Institute for Research and Training in Higher Education, University of Cincinnati, Cincinnati, Ohio, September 20, 1971.

Both types of communication are compared. Differences in the process of communication in each instance are compared. The relationship to teaching and psychological size is made, and the teacher's individual style and experimental new behavior are discussed.

Cushman, Frank, Training Procedures. Wiley and Sons, Inc., New York, 1943.

Four common fallacies of training packages are given. He lists and briefly describes sixteen training methods and devices.

Davis, Larry N., and McCallon, Earl, Planning, Conducting and Evaluating Workshops. Learning Concepts, 1974.

This book tends to be very perscriptive - almost a check list of do's and don'ts for conducting workshop sessions. It is not theoretical but should make a handy reference for quick review during any workshop phase - planning, conducting, or evaluating.

Davis, R.H., Alexander, L.T., and Yelon, S.L., Learning System Design: An Approach to the Improvement of Instruction. McGraw Hill Book Co., New York, 1974.

A good overview of instructional systems design. An orientation is not provided to any particular content area but the general approach to systems design is presented. Individuals must apply the information to their specific needs. The semi-programmed text, with sensible definitions, is easy to read.

Dubin, Robert, and Taveggia, Thomas C., The Teaching-Learning Paradox. University of Oregon, Eugene, Oregon, 1968.

The literature dealing with comparative studies of teaching techniques from 1924 to 1965 is covered. Comparisons are made on face-to-face methods (discussion, lecture, and combinations) and both supervised and unsupervised self-study. An important conclusion was reached that in no instance were significant differences in teaching methods found when results were measured by final examinations on course content.

Emerson, Lynn A., How to Prepare Training Manuals. University of the State of New York, Albany, New York, 1952.

Eight steps in the process of developing instructional materials are outlined along with six basic principles of learning. A useful aspect that is described are eight good, basic teaching practices which should be implemented in any teaching method.

Glaser, Robert, Training Research and Education. Wiley and Sons, Inc., New York, 1962.

Goldstein, Irwin L., Training: Program Development and Evaluation. Brooks/Cole Publishing Company, Monterey, California, 1974.

The advantages and disadvantages of practically every type of training method - lecture, on-the-job training (OJT) simulation, games, laboratory, films, TV, etc, are discussed. The preconditions for training, requisites for maximum transfer of training, and trainee motivation are covered thoroughly and in great detail. Actual studies are cited to substantiate statements. This text provides a good overview of the training process (from assessing instructional needs, deriving objectives selecting training media, conducting training, developing criteria, pretesting, monitoring training, evaluating training, to evaluating transfer of training). A section on behavioral objectives, listing five characteristics, is provided.

Grasha, Anthony F., Developing Alternative Teaching Methods Through An Analysis of Instructional Goals. Institute for Research and Training in Higher Education, University of Cincinnati, Cincinnati, Ohio, February 15, 1974.

This text provides a practical and simple approach which allows one to design a course (or training package) which is compatible with one's goals. A distinction between content and non-content goals is made and a summary is given of eight common course designs.

Knowles, Malcom S., The Modern Practice of Adult Education. Association Press, New York, 1972.

The following assumptions about adults are made: they are moving from dependent to a self-directed state; they have a large body of experience to draw on in their learning; they tend to be problem centered. These assumptions, together with suggestions on diagnosis versus evaluation and learning environment, should be helpful in establishing a relationship between the trainer and adult trainee that is conducive to learning.

McKeachie, Wilbert J., *Teaching Tips: A Guidebook for the Beginning College Teacher*. Lexington, Mass., D. C. Heath, 1969. Although designed for the new college teacher, much practical material on dealing with people in the "here and now" of the training environment is presented. The direct approach used here makes easy reading and a quick reference guide. Citations identify the literature that is appropriate to each area discussed.

EXTRACTS FROM
MSIS DOCUMENTS

Public Law 93-523
93rd Congress, S. 433
December 16, 1974

An Act

To amend the Public Health Service Act to assure that the public is provided with safe drinking water, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, Safe Drinking Water Act.

SHORT TITLE

SECTION 1. This Act may be cited as the "Safe Drinking Water Act". 42 USC 300f, note.

PUBLIC WATER SYSTEMS

SEC. 2. (a) The Public Health Service Act is amended by inserting after title XIII the following new title: 42 USC 201 note.

88 STAT. 1660
88 STAT. 1661

"TITLE XIV—SAFETY OF PUBLIC WATER SYSTEMS

"PART A—DEFINITIONS

"DEFINITIONS

"SEC. 1401. For purposes of this title: 42 USC 300f.

"(1) The term 'primary drinking water regulation' means a regulation which—

"(A) applies to public water systems;

"(B) specifies contaminants which, in the judgment of the Administrator, may have any adverse effect on the health of persons;

"(C) specifies for each such contaminant either—

"(i) a maximum contaminant level, if, in the judgment of the Administrator, it is economically and technologically feasible to ascertain the level of such contaminant in water in public water systems, or

"(ii) if, in the judgment of the Administrator, it is not economically or technologically feasible to so ascertain the level of such contaminant, each treatment technique known to the Administrator which leads to a reduction in the level of such contaminant sufficient to satisfy the requirements of section 1412; and Post, p. 1662.

"(D) contains criteria and procedures to assure a supply of drinking water which dependably complies with such maximum contaminant levels; including quality control and testing procedures to insure compliance with such levels and to insure proper operation and maintenance of the system, and requirements as to (i) the minimum quality of water which may be taken into the system and (ii) siting for new facilities for public water systems.

"(2) The term 'secondary drinking water regulation' means a regulation which applies to public water systems and which specifies the maximum contaminant levels which, in the judgment of the Administrator, are requisite to protect the public welfare. Such regulations may apply to any contaminant in drinking water (A) which may adversely affect the odor or appearance of such water and consequently may cause a substantial number of the persons served by the public water system providing such water to discontinue its use, or (B) which may otherwise adversely affect the public welfare. Such regulations may vary according to geographic and other circumstances.

"(3) The term 'maximum contaminant level' means the maximum permissible level of a contaminant in water which is delivered to any user of a public water system.

"(4) The term 'public water system' means a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves at least twenty-five individuals. Such term includes (A) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system, and (B) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system.

88 STAT. 1661
88 STAT. 1662

"(5) The term 'supplier of water' means any person who owns or operates a public water system.

"(6) The term 'contaminant' means any physical, chemical, biological, or radiological substance or matter in water.

"(7) The term 'Administrator' means the Administrator of the Environmental Protection Agency.

"(8) The term 'Agency' means the Environmental Protection Agency.

"(9) The term 'Council' means the National Drinking Water Advisory Council established under section 1446.

"(10) The term 'municipality' means a city, town, or other public body created by or pursuant to State law, or an Indian tribal organization authorized by law.

"(11) The term 'Federal agency' means any department, agency, or instrumentality of the United States.

"(12) The term 'person' means an individual, corporation, company, association, partnership, State, or municipality.

"PART B—PUBLIC WATER SYSTEMS

"COVERAGE

42 USC 300g.

"SEC. 1411. Subject to sections 1415 and 1416, national primary drinking water regulations under this part shall apply to each public water system in each State; except that such regulations shall not apply to a public water system—

- "(1) which consists only of distribution and storage facilities (and does not have any collection and treatment facilities);
- "(2) which obtains all of its water from, but is not owned or operated by, a public water system to which such regulations apply;
- "(3) which does not sell water to any person; and
- "(4) which is not a carrier which conveys passengers in interstate commerce.

"NATIONAL DRINKING WATER REGULATIONS

42 USC 300g-1.

"SEC. 1412. (a)(1) The Administrator shall publish proposed national interim primary drinking water regulations within 90 days after the date of enactment of this title. Within 180 days after such date of enactment, he shall promulgate such regulations with such modifications as he deems appropriate. Regulations under this paragraph may be amended from time to time.

"(2) National interim primary drinking water regulations promulgated under paragraph (1) shall protect health to the extent feasible, using technology, treatment techniques, and other means, which the Administrator determines are generally available (taking costs into consideration) on the date of enactment of this title.

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"(3) The interim primary regulations first promulgated under paragraph (1) shall take effect eighteen months after the date of their promulgation.

Publication in Federal Register.

"(b)(1)(A) Within 10 days of the date the report on the study conducted pursuant to subsection (e) is submitted to Congress, the Administrator shall publish in the Federal Register, and provide opportunity for comment on, the—

"(i) proposals in the report for recommended maximum contaminant levels for national primary drinking water regulations, and

"(ii) list in the report of contaminants the levels of which in drinking water cannot be determined but which may have an adverse effect on the health of persons.

Recommended maximum contaminant levels.

"(B) Within 90 days after the date the Administrator makes the publication required by subparagraph (A), he shall by rule establish recommended maximum contaminant levels for each contaminant which, in his judgment based on the report on the study conducted pursuant to subsection (e), may have any adverse effect on the health of persons. Each such recommended maximum contaminant level shall be set at a level at which, in the Administrator's judgment based on such report, no known or anticipated adverse effects on the health of persons occur and which allows an adequate margin of safety. In addition, he shall, on the basis of the report on the study conducted pursuant to subsection (e), list in the rules under this subparagraph any contaminant the level of which cannot be accurately enough measured in drinking water to establish a recommended maximum contaminant level and which may have any adverse effect on the health of persons. Based on information available to him, the Administrator may by rule change recommended levels established under this subparagraph or change such list.

Publication in Federal Register.

"(2) On the date the Administrator establishes pursuant to paragraph (1)(B) recommended maximum contaminant levels he shall publish in the Federal Register proposed revised national primary drinking water regulations (meeting the requirements of paragraph (3)). Within 180 days after the date of such proposed regulations, he shall promulgate such revised drinking water regulations with such modifications as he deems appropriate.

"(3) Revised national primary drinking water regulations promulgated under paragraph (2) of this subsection shall be primary drinking water regulations which specify a maximum contaminant level or require the use of treatment techniques for each contaminant for which a recommended maximum contaminant level is established or which is listed in a rule under paragraph (1)(B). The maximum contaminant level specified in a revised national primary drinking water regulation for a contaminant shall be as close to the recommended maximum contaminant level established under paragraph (1)(B) for such contaminant as is feasible. A required treatment technique for a contaminant for which a recommended maximum contaminant level has been established under paragraph (1)(B) shall reduce such contaminant to a level which is as close to the recommended maximum contaminant level for such contaminant as is feasible. A required treatment technique for a contaminant which is listed under paragraph (1)(B) shall

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"Feasible."

require treatment necessary in the Administrator's judgment to prevent known or anticipated adverse effects on the health of persons to the extent feasible. For purposes of this paragraph, the term 'feasible' means feasible with the use of the best technology, treatment techniques, and other means, which the Administrator finds are generally available (taking cost into consideration).

"(4) Revised national primary drinking water regulations shall be amended whenever changes in technology, treatment techniques, and other means permit greater protection of the health of persons, but in any event such regulations shall be reviewed at least once every 3 years.

"(5) Revised national primary drinking water regulations promulgated under this subsection (and amendments thereto) shall take effect eighteen months after the date of their promulgation. Regulations under subsection (a) shall be superseded by regulations under this subsection to the extent provided by the regulations under this subsection.

"(6) No national primary drinking water regulation may require the addition of any substance for preventive health care purposes unrelated to contamination of drinking water.

Proposed national secondary drinking water regulations, publication.

"(c) The Administrator shall publish proposed national secondary drinking water regulations within 270 days after the date of enactment of this title. Within 90 days after publication of any such regulation, he shall promulgate such regulation with such modifications as he deems appropriate. Regulations under this subsection may be amended from time to time.

Hearing.

"(d) Regulations under this section shall be prescribed in accordance with section 553 of title 5, United States Code (relating to rulemaking), except that the Administrator shall provide opportunity for public hearing prior to promulgation of such regulations. In proposing and promulgating regulations under this section, the Administrator shall consult with the Secretary and the National Drinking Water Advisory Council.

Study.

"(e)(1) The Administrator shall enter into appropriate arrangements with the National Academy of Sciences (or with another independent scientific organization if appropriate arrangements cannot be made with such Academy) to conduct a study to determine (A) the maximum contaminant levels which should be recommended under subsection (b)(2) in order to protect the health of persons from any known or anticipated adverse effects, and (B) the existence of any contaminants the levels of which in drinking water cannot be determined but which may have an adverse effect on the health of persons.

Report to Congress.

"(2) The result of the study shall be reported to Congress no later than 2 years after the date of enactment of this title. The report shall contain (A) a summary and evaluation of relevant publications and unpublished studies; (B) a statement of methodologies and assumptions for estimating the levels at which adverse health effects may occur; (C) a statement of methodologies and assumptions for estimating the margin of safety which should be incorporated in the national primary drinking water regulations; (D) proposals for recommended maximum contaminant levels for national primary drinking water regulations, based on the methodologies, assumptions, and studies referred to in clauses (A), (B), and (C) and in paragraph (4); (E) a list of contaminants the level of which in drinking water cannot be determined but which may have an adverse effect on the health of persons; and (F) recommended studies and test protocols for future research on the health effects of drinking water contaminants, including a list of the major research priorities and estimated costs necessary to conduct such priority research.

"(3) In developing its proposals for recommended maximum contaminant levels under paragraph (2)(D) the National Academy of Sciences (or other organization preparing the report) shall evaluate and explain (separately and in composite) the impact of the following considerations:

"(A) The existence of groups or individuals in the population which are more susceptible to adverse effects than the normal healthy adult

"(B) The exposure to contaminants in other media than drinking water (including exposures in food, in the ambient air, and in occupational settings) and the resulting body burden of contaminants.

"(C) Synergistic effects resulting from exposure to or interaction by two or more contaminants.

"(D) The contaminant exposure and body burden levels which alter physiological function or structure in a manner reasonably suspected of increasing the risk of illness.

"(4) In making the study under this subsection, the National Academy of Sciences (or other organization) shall collect and correlate (A) morbidity and mortality data and (B) monitored data on the quality of drinking water. Any conclusions based on such correlation shall be included in the report of the study.

"(5) Neither the report of the study under this subsection nor any draft of such report shall be submitted to the Office of Management and Budget or to any other Federal agency (other than the Environmental Protection Agency) prior to its submission to Congress. Report, submittal to OMB.

"(6) Of the funds authorized to be appropriated to the Administrator by this title, such amounts as may be required shall be available to carry out the study and to make the report directed by paragraph (2) of this subsection. Funds.

"STATE PRIMARY ENFORCEMENT RESPONSIBILITY

"SEC. 1413. (a) For purposes of this title, a State has primary enforcement responsibility for public water systems during any period for which the Administrator determines (pursuant to regulations prescribed under subsection (b)) that such State— 42 USC 300g-2.

"(1) has adopted drinking water regulations which (A) in the case of the period beginning on the date the national interim primary drinking water regulations are promulgated under section 1412 and ending on the date such regulations take effect are no less stringent than such regulations, and (B) in the case of the period after such effective date are no less stringent than the interim and revised national primary drinking water regulations in effect under such section;

"(2) has adopted and is implementing adequate procedures for the enforcement of such State regulations, including conducting such monitoring and making such inspections as the Administrator may require by regulation;

"(3) will keep such records and make such reports with respect to its activities under paragraphs (1) and (2) as the Administrator may require by regulation;

"(4) if it permits variances or exemptions, or both, from the requirements of its drinking water regulations which meet the requirements of paragraph (1), permits such variances and exemptions under conditions and in a manner which is not less stringent than the conditions under, and the manner in, which variances and exemptions may be granted under sections 1415 and 1416; and

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"(5) has adopted and can implement an adequate plan for the provision of safe drinking water under emergency circumstances.

Regulations.

Notice and hearing.

Publication in Federal Register.

Notice.

"(b)(1) The Administrator shall, by regulation (proposed within 180 days of the date of the enactment of this title), prescribe the manner in which a State may apply to the Administrator for a determination that the requirements of paragraphs (1), (2), (3), and (4) of subsection (a) are satisfied with respect to the State, the manner in which the determination is made, the period for which the determination will be effective, and the manner in which the Administrator may determine that such requirements are no longer met. Such regulations shall require that before a determination of the Administrator that such requirements are met or are no longer met with respect to a State may become effective, the Administrator shall notify such State of the determination and the reasons therefor and shall provide an opportunity for public hearing on the determination. Such regulations shall be promulgated (with such modifications as the Administrator deems appropriate) within 90 days of the publication of the proposed regulations in the Federal Register. The Administrator shall promptly notify in writing the chief executive officer of each State of the promulgation of regulations under this paragraph. Such notice shall contain a copy of the regulations and shall specify a State's authority under this title when it is determined to have primary enforcement responsibility for public water systems.

Applications.

"(2) When an application is submitted in accordance with the Administrator's regulations under paragraph (1), the Administrator shall within 90 days of the date on which such application is submitted (A) make the determination applied for, or (B) deny the application and notify the applicant in writing of the reasons for his denial.

"FAILURE BY STATE TO ASSURE ENFORCEMENT OF DRINKING WATER REGULATIONS

42 USC 300g-3.

"SEC. 1414. (a)(1)(A) Whenever the Administrator finds during a period during which a State has primary enforcement responsibility for public water systems (within the meaning of section 1413(a)) that any public water system—

"(i) for which a variance under section 1415 or an exemption under section 1416 is not in effect, does not comply with any national primary drinking water regulation in effect under section 1412, or

"(ii) for which a variance under section 1415 or an exemption under section 1416 is in effect, does not comply with any schedule or other requirement imposed pursuant thereto,

Notice.

he shall so notify the State and provide such advice and technical assistance to such State and public water system as may be appropriate to bring the system into compliance with such regulation or requirement by the earliest feasible time.

Notice.

Civil action.

"(B) If the Administrator finds such failure to comply extends beyond the thirtieth day after the date of the notice given pursuant to subparagraph (A), he shall give public notice of such finding and request the State to report within fifteen days from the date of such public notice as to the steps being taken to bring the system into compliance (including reasons for anticipated steps to be taken to bring the system into compliance and for any failure to take steps to bring the system into compliance). If—

"(i) such failure to comply extends beyond the sixtieth day after the date of the notice given pursuant to subparagraph (A); and "(ii)(α) the State fails to submit the report requested by the Administrator within the time period prescribed by the preceding sentence; or

"(β) the State submits such report within such period but the Administrator, after considering the report, determines that the State abused its discretion in carrying out primary enforcement responsibility for public water systems by both—

"(I) failing to implement by such sixtieth day adequate procedures to bring the system into compliance by the earliest feasible time, and

"(II) failing to assure by such day the provision through alternative means of safe drinking water by the earliest feasible time;

the Administrator may commence a civil action under subsection (b).

Civil action.

"(2) Whenever, on the basis of information available to him, the Administrator finds during a period during which a State does not have primary enforcement responsibility for public water systems that a public water system in such State—

"(A) for which a variance under section 1415(a)(2) or an exemption under section 1416(f) is not in effect, does not comply with any national primary drinking water regulation in effect under section 1412, or

"(B) for which a variance under section 1415(a)(2) or an exemption under section 1416(f) is in effect, does not comply with any schedule or other requirement imposed pursuant thereto,

he may commence a civil action under subsection (b).

"(b) The Administrator may bring a civil action in the appropriate United States district court to require compliance with a national primary drinking water regulation or with any schedule or other requirement imposed pursuant to a variance or exemption granted under section 1415 or 1416 if—

"(1) authorized under paragraph (1) or (2) of subsection (a), or

"(2) if requested by (A) the chief executive officer of the State in which is located the public water system which is not in compliance with such regulation or requirement, or (B) the agency of such State which has jurisdiction over compliance by public water systems in the State with national primary drinking water regulations or State drinking water regulations.

Judicial determination.

The court may enter, in an action brought under this subsection, such judgment as protection of public health may require, taking into consideration the time necessary to comply and the availability of alternative water supplies; and, if the court determines that there has been a willful violation of the regulation or schedule or other requirement with respect to which the action was brought, the court may, taking into account the seriousness of the violation, the population at risk, and other appropriate factors, impose on the violator a civil penalty of not to exceed $5,000 for each day in which such violation occurs.

Penalty.

Notice.

"(c) Each owner or operator of a public water system shall give notice to the persons served by it—

"(1) of any failure on the part of the public water system to—

"(A) comply with an applicable maximum contaminant level or treatment technique requirement of, or a testing procedure prescribed by, a national primary drinking water regulation, or

"(B) perform monitoring required by section 1445(a), and

"(2) if the public water system is subject to a variance granted under section 1415(a)(1)(A) or 1415(a)(2) for an inability to meet a maximum contaminant level requirement or is subject to an exemption granted under section 1416, of—

"(A) the existence of such variance or exemption, and

"(B) any failure to comply with the requirements of any schedule prescribed pursuant to the variance or exemption.

Regulations.

The Administrator shall by regulation prescribe the form and manner for giving such notice. Such notice shall be given not less than once every 3 months, shall be given by publication in a newspaper of general circulation serving the area served by each such water system (as determined by the Administrator), shall be furnished to the other communications media serving such area, and shall be furnished to the communications media as soon as practicable after the discovery of the violation with respect to which the notice is required. If the water bills of a public water system are issued more often than once every 3 months, such notice shall be included in at least one water bill of the system every 3 months, and if a public water system issues its water bills less often than once every 3 months, such notice shall be included in each of the water bills issued by the system. Any person who willfully violates this subsection or regulations thereunder shall be fined not more than $5,000.

Penalty.

"(d) Whenever, on the basis of information available to him, the Administrator finds that within a reasonable time after national secondary drinking water regulations have been promulgated, one or more public water systems in a State do not comply with such secondary regulations, and that such noncompliance appears to result from a failure of such State to take reasonable action to assure that public water systems throughout such State meet such secondary regulations, he shall so notify the State.

Notice.

"(e) Nothing in this title shall diminish any authority of a State or political subdivision to adopt or enforce any law or regulation respecting drinking water regulations or public water systems, but no such law or regulation shall relieve any person of any requirement otherwise applicable under this title.

"(f) If the Administrator makes a finding of noncompliance (described in subparagraph (A) or (B) of subsection (a)(1)) with respect to a public water system in a State which has primary enforcement responsibility, the Administrator may, for the purpose of assisting that State in carrying out such responsibility and upon the petition of such State or public water system or persons served by such system, hold, after appropriate notice, public hearings for the purpose of gathering information from technical or other experts, Federal, State, or other public officials, representatives of such public water system, persons served by such system, and other interested persons on—

Notice and public hearings.

"(1) the ways in which such system can within the earliest feasible time be brought into compliance with the regulation or requirement with respect to which such finding was made, and

"(2) the means for the maximum feasible protection of the public health during any period in which such system is not in compliance with a national primary drinking water regulation or requirement applicable to a variance or exemption.

On the basis of such hearings the Administrator shall issue recommendations which shall be sent to such State and public water system and shall be made available to the public and communications media.

"VARIANCES

"SEC. 1415. (a) Notwithstanding any other provision of this part, variances from national primary drinking water regulations may be granted as follows:

42 USC 300g-4.

"(1)(A) A State which has primary enforcement responsibility for public water systems may grant one or more variances from an applicable national primary drinking water regulation to one or more public water systems within its jurisdiction which, because of characteristics of the raw water sources which are reasonably available to the systems, cannot meet the requirements respecting the maximum contaminant levels of such drinking water regulation despite application of the best technology, treatment techniques, or other means, which the Administrator finds are generally available (taking costs into consideration). Before a State may grant a variance under this subparagraph, the State must find that the variance will not result in an unreasonable risk to health. If a State grants a public water system a variance under this subparagraph, the State shall prescribe within one year of the date the variance is granted, a schedule for—

"(i) compliance (including increments of progress) by the public water system with each contaminant level requirement with respect to which the variance was granted, and

"(ii) implementation by the public water system of such control measures as the State may require for each contaminant, subject to such contaminant level requirement, during the period ending on the date compliance with such requirement is required.

Notice and hearing.

Before a schedule prescribed by a State pursuant to this subparagraph may take effect, the State shall provide notice and opportunity for a public hearing on the schedule. A notice given pursuant to the preceding sentence may cover the prescribing of more than one such schedule and a hearing held pursuant to such notice shall include each of the schedules covered by the notice. A schedule prescribed pursuant to this subparagraph for a public water system granted a variance shall require compliance by the system with each contaminant level requirement with respect to which the variance was granted as expeditiously as practicable (as the State may reasonably determine).

"(B) A State which has primary enforcement responsibility for public water systems may grant to one or more public water systems within its jurisdiction one or more variances from any provision of a national primary drinking water regulation which requires the use of a specified treatment technique with respect to a contaminant if the public water system applying for the variance demonstrates to the satisfaction of the State that such treatment technique is not necessary to protect the health of persons because of the nature of the raw water source of such system. A variance granted under this subparagraph shall be conditioned on such monitoring and other requirements as the Administrator may prescribe.

Notice and hearing.

"(C) Before a variance proposed to be granted by a State under subparagraph (A) or (B) may take effect, such State shall provide notice and opportunity for public hearing on the proposed variance. A notice given pursuant to the preceding sentence may cover the granting of more than one variance and a hearing held pursuant to such notice shall include each of the variances covered by the notice. The State shall promptly notify the Administrator

Notice to Administrator.

of all variances granted by it. Such notification shall contain the reason for the variance (and in the case of a variance under subparagraph (A), the basis for the finding required by that subparagraph before the granting of the variance) and documentation of the need for the variance.

Compliance; enforcement.

"(D) Each public water system's variance granted by a State under subparagraph (A) shall be conditioned by the State upon compliance by the public water system with the schedule prescribed by the State pursuant to that subparagraph. The requirements of each schedule prescribed by a State pursuant to that subparagraph shall be enforceable by the State under its laws. Any requirement of a schedule on which a variance granted under that subparagraph is conditioned may be enforced under section 1414 as if such requirement was part of a national primary drinking water regulation.

"(E) Each schedule prescribed by a State pursuant to subparagraph (A) shall be deemed approved by the Administrator unless the variance for which it was prescribed is revoked by the Administrator under subparagraph (G) or the schedule is revised by the Administrator under such subparagraph.

Review of variances and schedules.

Publication in Federal Register.

Publication in Federal Register.

"(F) Not later than 18 months after the effective date of the interim national primary drinking water regulations the Administrator shall complete a comprehensive review of the variances granted under subparagraph (A) (and schedules prescribed pursuant thereto) and under subparagraph (B) by the States during the one-year period beginning on such effective date. The Administrator shall conduct such subsequent reviews of variances and schedules as he deems necessary to carry out the purposes of this title, but each subsequent review shall be completed within each 3-year period following the completion of the first review under this subparagraph. Before conducting any review under this subparagraph, the Administrator shall publish notice of the proposed review in the Federal Register. Such notice shall (i) provide information respecting the location of data and other information respecting the variances to be reviewed (including data and other information concerning new scientific matters bearing on such variances), and (ii) advise of the opportunity to submit comments on the variances reviewed and on the need for continuing them. Upon completion of any such review, the Administrator shall publish in the Federal Register the results of his review together with findings responsive to comments submitted in connection with such review.

Notice to State.

"(G)(i) If the Administrator finds that a State has, in a substantial number of instances, abused its discretion in granting variances under subparagraph (A) or (B) or that in a substantial number of cases the State has failed to prescribe schedules in accordance with subparagraph (A), the Administrator shall notify the State of his findings. In determining if a State has abused its discretion in granting variances in a substantial number of instances, the Administrator shall consider the number of persons who are affected by the variances and if the requirements applicable to the granting of the variances were complied with. A notice under this clause shall—

"(I) identify each public water system with respect to which the finding was made,

"(II) specify the reasons for the finding, and

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"(III) as appropriate, propose revocations of specific variances or propose revised schedules or other requirements for specific public water systems granted variances, or both.

Notice and hearing.

"(ii) The Administrator shall provide reasonable notice and public hearing on the provisions of each notice given pursuant to clause (i) of this subparagraph. After a hearing on a notice pursuant to such clause, the Administrator shall (I) rescind the finding for which the notice was given and promptly notify the State of such rescission, or (II) promulgate (with such modifications as he deems appropriate) such variance revocations and revised schedules or other requirements proposed in such notice as he deems appropriate. Not later than 180 days after the date a notice is given pursuant to clause (i) of this subparagraph, the Administrator shall complete the hearing on the notice and take the action required by the preceding sentence.

"(iii) If a State is notified under clause (i) of this subparagraph of a finding of the Administrator made with respect to a variance granted a public water system within that State or to a schedule or other requirement for a variance and if, before a revocation of such variance or a revision of such schedule or other requirement promulgated by the Administrator takes effect, the State takes corrective action with respect to such variance or schedule or other requirement which the Administrator determines makes his finding inapplicable to such variance or schedule or other requirement, the Administrator shall rescind the application of his finding to that variance or schedule or other requirement. No variance revocation or revised schedule or other requirement may take effect before the expiration of 90 days following the date of the notice in which the revocation or revised schedule or other requirement was proposed.

"(2) If a State does not have primary enforcement responsibility for public water systems, the Administrator shall have the same authority to grant variances in such State as the State would have under paragraph (1) if it had primary enforcement responsibility.

"(3) The Administrator may grant a variance from any treatment technique requirement of a national primary drinking water regulation upon a showing by any person that an alternative treatment technique not included in such requirement is at least as efficient in lowering the level of the contaminant with respect to which such requirement was prescribed. A variance under this paragraph shall be conditioned on the use of the alternative treatment technique which is the basis of the variance.

"(b) Any schedule or other requirement on which a variance granted under paragraph (1)(B) or (2) of subsection (a) is conditioned may be enforced under section 1414 as if such schedule or other requirement was part of a national primary drinking water regulation.

Applications for variances.

Regulations.

"(c) If an application for a variance under subsection (a) is made, the State receiving the application or the Administrator, as the case may be, shall act upon such application within a reasonable period (as determined under regulations prescribed by the Administrator) after the date of its submission.

"Treatment technique requirement."

"(d) For purposes of this section, the term 'treatment technique requirement' means a requirement in a national primary drinking water regulation which specifies for a contaminant (in accordance with section 1401(1)(C)(ii)) each treatment technique known to the Administrator which leads to a reduction in the level of such contaminant sufficient to satisfy the requirements of section 1412(b)(3).

"EXEMPTIONS

42 USC 300g-5. "SEC. 1416. (a) A State which has primary enforcement responsibility may exempt any public water system within the State's jurisdiction from any requirement respecting a maximum contaminant level or any treatment technique requirement, or from both, of an applicable national primary drinking water regulation upon a finding that—

"(1) due to compelling factors (which may include economic factors), the public water system is unable to comply with such contaminant level or treatment technique requirement.

"(2) the public water system was in operation on the effective date of such contaminant level or treatment technique requirement, and

"(3) the granting of the exemption will not result in an unreasonable risk to health.

"(b)(1) If a State grants a public water system an exemption under subsection (a), the State shall prescribe, within one year of the date the exemption is granted, a schedule for—

"(A) compliance (including increments of progress) by the public water system with each containment level requirement and treatment technique requirement with respect to which the exemption was granted, and

"(B) implementation by the public water system of such control measures as the State may require for each containment, subject to such contaminant level requirement or treatment technique requirement, during the period ending on the date compliance with such requirement is required.

Notice and hearing. Before a schedule prescribed by a State pursuant to this subsection may take effect, the State shall provide notice and opportunity for a public hearing on the schedule. A notice given pursuant to the preceding sentence may cover the prescribing of more than one such schedule and a hearing held pursuant to such notice shall include each of the schedules covered by the notice.

"(2)(A) A schedule prescribed pursuant to this subsection for a public water system granted an exemption under subsection (a) shall require compliance by the system with each contaminant level and treatment technique requirement with respect to which the exemption was granted as expeditiously as practicable (as the State may reasonably determine) but (except as provided in subparagraph (B))—

"(i) in the case of an exemption granted with respect to a contaminant level or treatment technique requirement prescribed by the interim national primary drinking water regulations promulgated under section 1412(a), not later than January 1, 1981; and

"(ii) in the case of an exemption granted with respect to a contaminant level or treatment technique requirement prescribed by revised national primary drinking water regulations, not later than seven years after the date such requirement takes effect.

"(B) Notwithstanding clauses (i) and (ii) of subparagraph (A) of this paragraph, the final date for compliance prescribed in a schedule prescribed pursuant to this subsection for an exemption granted for a public water system which (as determined by the State granting the exemption) has entered into an enforceable agreement to become a part of a regional public water system shall—

"(i) in the case of a schedule prescribed for an exemption granted with respect to a contaminant level or treatment technique requirement prescribed by interim national primary drinking water regulations, be not later than January 1, 1983; and "(ii) in the case of a schedule prescribed for an exemption granted with respect to a contaminant level or treatment technique requirement prescribed by revised national primary drinking water regulations, be not later than nine years after such requirement takes effect.

Compliance; enforcement.

"(3) Each public water system's exemption granted by a State under subsection (a) shall be conditioned by the State upon compliance by the public water system with the schedule prescribed by the State pursuant to this subsection. The requirements of each schedule prescribed by a State pursuant to this subsection shall be enforceable by the State under its laws. Any requirement of a schedule on which an exemption granted under this section is conditioned may be enforced under section 1414 as if such requirement was part of a national primary drinking water regulation.

"(4) Each schedule prescribed by a State pursuant to this subsection shall be deemed approved by the Administrator unless the exemption for which it was prescribed is revoked by the Administrator under subsection (d)(2) or the schedule is revised by the Administrator under such subsection.

Notice to Administrator.

"(c) Each State which grants an exemption under subsection (a) shall promptly notify the Administrator of the granting of such exemption. Such notification shall contain the reasons for the exemption (including the basis for the finding required by subsection (a)(3) before the exemption may be granted) and document the need for the exemption.

Review of exemptions and schedules.

"(d)(1) Not later than 18 months after the effective date of the interim national primary drinking water regulations the Administrator shall complete a comprehensive review of the exemptions granted (and schedules prescribed pursuant thereto) by the States during the one-year period beginning on such effective date. The Administrator shall conduct such subsequent reviews of exemptions and schedules as he deems necessary to carry out the purposes of this title, but each subsequent review shall be completed within each 3-year period following the completion of the first review under this subparagraph. Before conducting any review under this subparagraph, the Administrator shall publish notice of the proposed review in the Federal Register. Such notice shall (A) provide information respecting the location of data and other information respecting the exemptions to be reviewed (including data and other information concerning new scientific matters bearing on such exemptions), and (B) advise of the opportunity to submit comments on the exemptions reviewed and on the need for continuing them. Upon completion of any such review, the Administrator shall publish in the Federal Register the results of his review together with findings responsive to comments submitted in connection with such review.

Publication in Federal Register.

Publication in Federal Register.

"(2)(A) If the Administrator finds that a State has, in a substantial number of instances, abused its discretion in granting exemptions under subsection (a) or failed to prescribe schedules in accordance with subsection (b), the Administrator shall notify the State of his finding. In determining if a State has abused its discretion in granting exemptions in a substantial number of instances, the Administrator shall consider the number of persons who are affected by the exemptions and if the requirements applicable to the granting of the exemptions were complied with. A notice under this subparagraph shall—

Notice to State.

"(i) identify each exempt public water system with respect to which the finding was made,

"(ii) specify the reasons for the finding, and "(iii) as appropriate, propose revocations of specific exemptions or propose revised schedules for specific exempt public water systems, or both.

Notice and hearing.

"(B) The Administrator shall provide reasonable notice and public hearing on the provisions of each notice given pursuant to subparagraph (A). After a hearing on a notice pursuant to subparagraph (A), the Administrator shall (i) rescind the finding for which the notice was given and promptly notify the State of such rescission, or (ii) promulgate (with such modifications as he deems appropriate) such exemption revocations and revised schedules proposed in such notice as he deems appropriate. Not later than 180 days after the date a notice is given pursuant to subparagraph (A), the Administrator shall complete the hearing on the notice and take the action required by the preceding sentence.

"(C) If a State is notified under subparagraph (A) of a finding of the Administrator made with respect to an exemption granted a public water system within that State or to a schedule prescribed pursuant to such an exemption and if before a revocation of such exemption or a revision of such schedule promulgated by the Administrator takes effect the State takes corrective action with respect to such exemption or schedule which the Administrator determines makes his finding inapplicable to such exemption or schedule, the Administrator shall rescind the application of his finding to that exemption or schedule. No exemption revocation or revised schedule may take effect before the expiration of 90 days following the date of the notice in which the revocation or revised schedule was proposed.

"Treatment technique requirement."

"(e) For purposes of this section, the term 'treatment technique requirement' means a requirement in a national primary drinking water regulation which specifies for a contaminant (in accordance with section 1401(1)(C)(ii)) each treatment technique known to the Administrator which leads to a reduction in the level of such contaminant sufficient to satisfy the requirements of section 1412(b)(3).

"(f) If a State does not have primary enforcement responsibility for public water systems, the Administrator shall have the same authority to exempt public water systems in such State from maximum contaminant level requirements and treatment technique requirements under the same conditions and in the same manner as the State would be authorized to grant exemptions under this section if it had primary enforcement responsibility.

Applications for exemptions.

"(g) If an application for an exemption under this section is made, the State receiving the application or the Administrator, as the case may be, shall act upon such application within a reasonable period (as determined under regulations prescribed by the Administrator) after the date of its submission.

"PART C—PROTECTION OF UNDERGROUND SOURCES OF DRINKING WATER

"REGULATIONS FOR STATE PROGRAMS

42 USC 300h.

"SEC. 1421. (a)(1) The Administrator shall publish proposed regulations for State underground injection control programs within 180 days after the date of enactment of this title. Within 180 days after publication of such proposed regulations, he shall promulgate such regulations with such modifications as he deems appropriate. Any regulation under this subsection may be amended from time to time.

federal register

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PART IV:

ENVIRONMENTAL PROTECTION AGENCY

■

WATER PROGRAMS

National Interim Primary Drinking Water Regulations

Title 40—Protection of Environment

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

SUBCHAPTER D—WATER PROGRAMS

[FRL 464-7]

PART 141—NATIONAL INTERIM PRIMARY DRINKING WATER REGULATIONS

On March 14, 1975, the Environmental Protection Agency (EPA) proposed National Interim Primary Drinking Water Regulations pursuant to sections 1412, 1414, 1415, and 1450 of the Public Health Service Act ("the Act"), as amended by the Safe Drinking Water Act ("SDWA," Pub. L. 93-523), 40 FR 11990. EPA held public hearings on the proposed regulations in Boston, Chicago, San Francisco, and Washington during the month of April. Several thousand pages of comments on the proposed regulations were received and evaluated. In addition, the Agency has received comments and information on the proposed regulations from the National Drinking Water Advisory Council, the Secretary of Health, Education, and Welfare, and from numerous others during meetings with representatives of State agencies, public interest groups and others.

The regulations deal only with the basic legal requirements. Descriptive material will be provided in a guidance manual for use by public water systems and the States.

The purpose of this preamble to the final regulations is to summarize the most significant changes made in the proposed regulations as a result of comments received and the further consideration of available information. A more detailed discussion of the comments and of changes in the proposed regulations is attached as Appendix A.

WATER SYSTEMS COVERED

The Safe Drinking Water Act applies to each "public water system," which is defined in Section 1401(4) of the Act as "a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves at least twenty-five individuals." Privately owned as well as publicly owned systems are covered. Service "to the public" is interpreted by EPA to include factories and private housing developments. (See generally, House Report, pp. 16-17.)

The definition of "public water system" proposed in the Interim Primary Drinking Water Regulations sought to explain the meaning of the statutory reference to "regular" service. It was proposed to interpret this term as including service for as much as three months during the year. Because the proposed definition would have excluded many large campgrounds, lodges, and other public accommodations which serve large numbers of tourists but which are open for slightly less than three months each year, the definition in the final version covers systems serving an average of at least twenty-five individuals at least 60 days out of the year. The use of a minimum number of days rather than months also makes clear that a system may qualify as a public water system even if it is not open every day during a given month.

Once "public water system" has been defined, it is necessary to define the two major types of public water systems—those serving residents and those serving transients or intermittent users. The possible health effects of a contaminant in drinking water in many cases are quite different for a person drinking the water for a long period of time than for a person drinking the water only briefly or intermittently. Different regulatory considerations may in some cases apply to systems which serve residents as opposed to systems which serve transients or intermittent users. Accordingly, § 141.2(e) makes clear that all "public water systems" fall within either the category of "community water systems" or the category of "non-community water systems." To make clear which regulatory requirements apply to which type of system, the category covered is specifically indicated throughout the regulations.

The proposed regulations defined a "community water system" as "a public water system which serves a population of which 70 percent or greater are residents." Reliance in the proposed definition on the percentage of water system users who are residents would result in treating some fairly large resort communities with many year-round residents as non-community systems. Therefore, the definition of "community water system" has been changed to cover any system which serves at least 15 service connections used by year-round residents or serves at least 25 year-round residents.

SMALL COMMUNITY WATER SYSTEMS

Many community water systems in the country are quite small. Since it is the intention of the Act to provide basically the same level of health protection to residents of small communities as to residents of large cities, and since a number of advanced water treatment techniques are made feasible only by economies of scale, the cost of compliance with the requirements of the Act may pose a serious problem for many small communities. The regulations seek to recognize the financial problems of small communities by requiring more realistic monitoring for systems serving fewer than 1,000 persons. Variances and exemptions authorized by the Act can also assist in dealing with economic problems of small community systems in appropriate cases, at least temporarily. EPA will provide technical assistance on effective treatment techniques which can be used by small systems.

These methods of dealing with the financial problems of some small community systems may not be sufficient in specific instances to make compliance with all applicable regulatory requirements feasible. EPA is commencing a study of potential problems faced by small community systems in meeting applicable requirements under the Act and these regulations, and, if necessary, will make additional adjustments in the Interim Primary Drinking Water Regulations prior to their effective date.

NON-COMMUNITY SYSTEMS

"Non-community systems" are basically those systems which serve transients. They include hotels, motels, restaurants, campgrounds, service stations, and other public accommodations which have their own water system and which have at least 15 service connections or serve water to a daily average of at least 25 persons. Some schools, factories and churches are also included in this category. It is conservatively estimated that there are over 200,000 non-community water systems in the country. However, it should be recognized that while their number is large, they normally are not the principal source of water for the people they serve.

The regulations as proposed would have applied all maximum contaminant levels to non-community systems as well as to community systems. This approach failed to take into account the fact that the proposed maximum contaminant levels for organic chemicals and most inorganic chemicals were based on the potential health effects of long-term exposure. Those levels are not necessary to protect transients or intermittent users. Therefore, the final regulations provide that maximum contaminant levels for organic chemicals, and for inorganic chemicals other than nitrates, are not applicable to non-community systems. An exception was made for nitrates because they can have an adverse health effect on susceptible infants in a short period of time.

Even without monitoring for organic chemicals or most inorganic chemicals, in the initial stages of implementation of the drinking water regulations, monitoring results from tens of thousands of non-community systems could overwhelm laboratory capabilities and other resources. This could delay effective implementation of the regulations with respect to the community systems which provide the water which Americans drink every day. To avoid this result, non-community systems will be given two years after the effective date of the regulations to commence monitoring. In the meantime, non-community systems which already monitor their water are encouraged to continue to do so, and the States are encouraged to take appropriate measures to test or require monitoring for non-community systems that serve large numbers of people.

Of course, non-community systems which pose a threat to health should be dealt with as quickly as possible. The maximum contaminant levels applicable to non-community water systems therefore will take effect 18 months after promulgation, at the same time as levels applicable to community systems. Inspection and enforcement authority will apply to non-community systems at the same time as to community systems.

SANITARY SURVEYS

EPA encourages the States to conduct sanitary surveys on a systematic basis.

These on-site inspections of water systems are more effective in assuring safe water to the public than individual tests taken in the absence of sanitary surveys. The regulations provide that monitoring frequencies for coliform bacteria can be changed by the entity with primary enforcement responsibility for an individual non-community system, and in certain circumstances for an individual community system, based on the results of a sanitary survey.

MAXIMUM CONTAMINANT LEVELS

Numerous comments were received by EPA on the substances selected for the establishment of maximum contaminant levels and on the levels chosen. Congress anticipated that the initial Interim Primary Drinking Water Regulations would be based on the Public Health Service Standards of 1962, and this Congressional intent has been followed. Comments received on the various levels did not contain new data sufficient to require the establishment of levels different from those contained in the Public Health Service Standards.

WATER CONSUMPTION

The maximum contaminant levels are based, directly or indirectly, on an assumed consumption of two liters of water per day. The same assumption was used in the 1962 Standards. This assumption has been challenged because of instances where much higher water consumption rates occur. EPA's justification for using the two-liter figure is that it already represents an above average water or water-based fluid intake. Moreover, while the factor of safety may be somewhat reduced when greater quantities of water are ingested, the maximum contaminant levels based on the two-liter figure provide substantial protection to virtually all consumers. If, as has been suggested, a water consumption rate of eight liters per day is used as the basis for maximum contaminant level, all of the proposed MCL's would have to be divided by four, greatly increasing the monitoring difficulties, and in some cases challenging the sensitivity of accepted analytical procedures. It could be expected, in such a case, that the maximum contaminant levels would be exceeded to a significant degree, and that specialised treatment techniques would be required to order that the contaminant levels would be reduced. The economic impact of a move in this direction would be enormous. It is not technically or economically feasible to base maximum contaminant levels on unusually high consumption rates.

SAFETY FACTORS

A question was raised about the fact that different safety factors are contained in various maximum contaminant levels. The levels are not intended to have a uniform safety factor, at least partly because the knowledge of and the nature of the health risks of the various contaminants vary widely. The levels set are the result of experience, evaluation of the available data, and professional judgment. They have withstood the test of time and of professional review. They are being subjected to further review by the National Academy of Sciences in connection with development of data for the Revised Primary Drinking Water Regulations.

MCL'S BASED ON TEMPERATURE

A question was also raised as to whether ranges of maximum contaminant levels should be established on the basis of the climate in the area served by the public water system, as was done with fluoride. EPA believes that the use of a temperature scale for fluoride is more appropriate than for other chemicals because of the studies available on the fluoride-temperature relationship and because there is a small margin with fluoride between beneficial levels and levels that cause adverse health effects.

MCL'S DELETED

Three proposed maximum contaminant levels have been eliminated in the final regulations because they are not justified by the available data. One of these is carbon chloroform extract (CCE), which is discussed separately below. The others are the proposed levels for the standard bacterial plate count and cyanide. In the case of the plate count, it is believed that the coliform limits contained in the regulations, combined with the turbidity maximum contaminant level, adequately deal with bacterial contamination. However, EPA continues to believe that the standard plate count is a valid indicator of bacteriological quality of drinking water and recommends that it be used in appropriate cases in conjunction with the coliform tests as an operational tool.

The proposed maximum contaminant level for cyanide was eliminated because the possibility of cyanide contamination can be effectively addressed only by the use of emergency action, such as under Section 1431 of the Act. EPA's 1969 Community Water Supply Study did not reveal a single instance in which cyanide was present in a water system at a level greater than one-thousandth of the level at which cyanide is toxic to humans.

Available data indicate that cyanide will be present in water systems at toxic levels only in the event of an accident, such as a spill from a barge collision. Maximum contaminant levels are not the appropriate vehicle for dealing with such rare, accidental contamination.

Heptachor, heptachlor epoxide and chlordane have also been removed from the list of maximum contaminant levels at least temporarily in view of the pending cancellation and suspension proceedings under the Federal Insecticide, Fungicide and Rodenticide Act involving those pesticides. When the results of these proceedings are available, EPA will again consider whether maximum contaminant levels should be established for those three pesticides.

SODIUM AND SULFATES

A number of comments were received on the potential health effects of sodium and sulfates. The National Drinking Water Advisory Council has recommended that consideration be given to the monitoring of these constituents, but has not recommended the adoption of maximum contaminant levels because available data do not support the adoption of any specific levels. EPA has requested the National Academy of Sciences to include sodium and sulfates among the contaminants to be studied by NAS, and to include information on the health effects of sodium and sulfates in the report to be made by NAS in December 1976.

Since a number of persons suffer from diseases which are influenced by dietary sodium intake and since there are others who wish to restrict their sodium intake, it is desirable that the sodium content of drinking water be known. Those affected can, by knowing the sodium concentration in their drinking water, make adjustments to their diets or, in extreme cases, seek alternative sources of water to be used for drinking and food preparation. It is recommended that the States institute programs for regular monitoring of the sodium content of drinking water served to the public, and for informing physicians and consumers of the sodium concentration in drinking water.

A relatively high concentration of sulfate in drinking water has little or no known laxative effect on regular users of the water, but transcients using such water sometimes experience a laxative effect. It is recommended that the States institute monitoring programs for sulfates, and that transients be notified if the sulfate content of the water is high. Such notification should include an assessment of the possible physiological effects of consumption of the water.

PCB'S AND ASBESTOS

An interagency comment expressed concern for asbestos and PCB's in the environment and noted the need for at least a monitoring requirement, if not for MCL's, for these contaminants. EPA is also concerned, but for the moment lacks sufficient evidence regarding analytical methods, health effects, or occurrence in the environment to establish MCL's. The Agency is conducting research and cooperating in research projects to develop criteria for establishing needed limits as quickly as possible. A monitoring study on a number of organic chemical contaminants including PCB's, for which MCL's are not being established at this time, will be contained in an organic chemical monitoring regulation that is being promulgated with these regulations. Regarding asbestos, HEW and EPA are sponsoring a number of studies this year at an approximate cost of $16 million to establish health effects, anaylitical methods and occurrence.

POINT OF MEASUREMENT

Other comments on maximum contaminant levels focused on the proposed requirement that such levels be tested at the consumer's tap. Concern was expressed over the inability of the public water system to control potential sources of contaminants which are under the control of the consumer.

The promulgated definition of "maximum contaminant level," § 141.2(d), retains the requirement that the maximum contaminant level be measured at the tap except in the case of turbidity, which should be measured at the point of entry to the distribution system. However, the definition has been expanded to make clear that contaminants added to the water by circumstances under the control of the consumer are not the responsibility of the supplier of water, unless the contaminants result from corrosion of piping and plumbing resulting from the quality of the water supplied. It should be noted, however, that this requirement should not be interpreted as to discourage local, aggressive cross connection control measures.

Coliform Bacteria MCL's

The promulgated MCL's for coliform bacteria are basically the 1962 Public Health Service Standards, with minor refinements and clarifications. However, further changes may be desirable. For example, the MCL's for the membrane filter analytical method do not resolve the question of how many coliform bacteria are assumed to be present in a single highly contaminated sample. Some laboratories assume an upper limit of 50 while others seek to continue to count individual bacteria to a level of 100 or even higher in a single sample. The upper limit assumed will affect the monthly average which is calculated to determine compliance with the MCL's.

Another question relating to the coliform bacteria MCL's is the matter of possible spurious positive samples. As the regulations are written, all routine samples taken to determine compliance with the MCL's must be counted, regardless of the results of analysis of any check samples that may be taken. The reason for this is that bacterial contamination is often intermittent or transient, and as a result negative check samples taken a day or more after a positive sample cannot demonstrate that the positive result was in error. It may be possible, however, to prescribe a means of dealing with spurious positive results without compromising the integrity of the MCL's.

A third question concerning the MCL's for coliform bacteria is the relationship of monthly averages of coliform bacteria levels to monthly percentages of positive samples. For example, the monthly average MCL for the membrane filter method is violated if the monthly average exceeds one coliform bacterium per sample. However, for purposes of determining whether the monthly-percentage-of-positive-samples MCL is violated, a sample is counted as positive only if it contains more than four coliform bacteria. Thus, it is possible, particularly when a relatively small number of samples is taken, for a system to fail the monthly average MCL even when no single sample taken during the month is out of compliance with the limit.

These and other questions concerning the coliform bacteria MCL's will be reviewed further by EPA. If review indicates that changes in the MCL's are desirable, those changes will be made as soon as possible but within 6 months, in time to take effect at the same time as the initial Interim Primary Drinking Water Regulations.

Organic Chemicals

The proposed maximum contaminant levels for organic pesticides, other than the three which are the subject of cancellation and suspension proceedings, have been retained. It is anticipated that additional organic pesticides will be added to the regulations if surveys of pesticides in drinking water being conducted by EPA indicate that this is needed.

The proposed regulations also contained a maximum contaminant level for organic chemicals obtained by the carbon chloroform extract (CCE) method. It was anticipated by Congress that organic chemicals would be dealt with primarily in the Revised Primary Drinking Water Regulations because of the paucity of accurate data on the health effects of various organic chemicals, the large number of such chemicals, uncertainities over appropriate treatment techniques, and the need for additional information on the incidence of specific organic chemicals in drinking water supplies. EPA thought that the CCE standard might provide an appropriate means of dealing with organic chemicals as a class pending action on the Revised Primary Regulations.

The CCE standard was originally developed as a test for undesirable tastes and odors in drinking water. As concern developed over the health effects of organic chemicals, the possibility of using CCE as a health standard rather than an esthetic standard was considered.

As pointed out by numerous comments, CCE has many failings as an indicator of health effects of organic chemicals. To begin with, the test obtains information on only a fraction of the total amount of organic chemicals in the water sampled. Furthermore, there is serious question as to the reliability of CCE in identifying those organic chemicals which are most suspected of adverse health effects. In addition, there are no existing data on which a specific level for CCE can be established on a rational basis. To establish a maximum contaminant level under these circumstances would almost certainly do more harm than good. It could give a false sense of security to persons served by systems which are within the established level and a false sense of alarm to persons served by systems which exceed the level. It also would divert resources from efforts to find more effective ways of dealing with the organic chemicals problem.

EPA believes that the intelligent approach to the organic chemicals question is to move ahead as rapidly as possible along two fronts. First, EPA is adopting simultaneously with these regulations a Subpart E of Part 141, containing requirements for organic chemical monitoring pursuant to Sections 1445 and 1450 of the Act.

The regulations require that designated public water systems collect samples of raw and treated water for submission to EPA for organics analysis. EPA will analyze the samples for a number of broad organic parameters, including carbon chloroform extract (CCE), volatile and non-volatile total organic carbon (VTOC and NVTOC), total organic chlorine (TOCl), ultraviolet absorbancy, and fluorescence. In addition, monitoring will be required for probably 21 specific organic compounds. Selection of the specific compounds has been based on the occurrence or likelihood of occurrence in treated water, toxicity data and availability of practical analytical methods. Laboratory analyses will be used to evaluate the extent and nature of organic chemical contamination of drinking water, to evaluate the validity of the general organic parameters as surrogates for measures of harmful organic chemicals, and to determine whether there is an adequate basis for establishing maximum contaminant levels for specific organics or groups of organics.

Second, EPA is embarking on an intensive research program to find answers to the following four questions:

1. What are the effects of commonly occurring organic compounds on human health?

2. What analytical procedures should be used to monitor finished drinking water to assure that any Primary Drinking Water Regulations dealing with organics are met?

3. Because some of these organic compounds are formed during water treatment, what changes in treatment practices are required to minimise the formation of these compounds in treated water?

4. What treatment technology must be applied to reduce contaminant levels to concentrations that may be specified in the Primary Drinking Water Regulations?

This research will involve health-effects and epidemiological studies, investigations of analytical methodology, and pilot plant and field studies of organic removal unit processes. Some phases of the research are to be completed by the end of this year, while much of the remainder are to be completed within the next calendar year.

As soon as sufficient information is derived from the monitoring program and related research, the Interim Primary Drinking Water Regulations will be amended so that the organic chemicals problem can be dealt with without delay. The monitoring process will be completed within 1 year.

During the interim period, while satisfactory MCL's for organic contamination in drinking water are being developed, EPA will act in specific cases where appropriate to deal with organic contamination. If the EPA monitoring program reveals serious specific cases of contamination, EPA will work with State and local authorities to identify the source and nature of the problem and to take remedial action. EPA will also aid the States in identifying additional community water supplies that require analysis.

PUBLIC NOTICE

The public notice requirements proposed in § 141.32 did not distinguish between community and non-community public water systems. They would have required that public notice of non-compliance with applicable regulations be made by newspaper, in water bills, and by other media for all public water systems. These requirements are inappropriate and ineffective in the case of most non-community water systems. Those systems principally serve transients who do not receive water bills from the system and who probably are not exposed significantly to the local media. A more effective approach would be to require notice that can inform the transient before he drinks the system's water, and thereby both warn the transient and provide an incentive to the supplier of water to remedy the violation. Accordingly, Section 141.32 as adopted provides that in the case of non-community systems, the entity with primary enforcement responsibility shall require that notice be given in a form and manner that will insure that the public using the public water system is adequately informed.

The proposed public notice requirements also failed to distinguish between different types of violations of the Interim Primary Drinking Water Regulations. Since the urgency and importance of a notice varies according to the nature of the violation involved, § 141.32 as promulgated seeks to match the type of notice required with the type of violation involved. Written notice accompanying a water bill or other direct notice by mail is required for all violations of the regulations, including violations of monitoring requirements, and for the grant of a variance or exemption. In addition, notice by newspaper and notification to radio and television stations is required whenever a maximum contaminant level is exceeded, or when the entity with primary enforcement responsibility requires such broader notice.

QUALITY CONTROL AND TESTING PROCEDURES

Section 1401(1) of the Act defines "primary drinking water regulation" to include "quality control and testing procedures." The promulgated regulations include testing requirements for each maximum contaminant level, including check samples and special samples in appropriate cases. The regulations also specify the procedures to be followed in analyzing samples for each of the maximum contaminant levels. These procedures will be updated from time to time as advances are made in analytical methods. For example, references to "Standard Methods for the Examination of Water and Wastewater" are to the current, 13th, edition, but these references will be changed to cite the 14th edition when it is available in the near future.

A key element of quality control for public water systems is accurate laboratory analysis. Section 141.28 of the regulations provides that analyses conducted for the purpose of determining compliance with maximum contaminant levels must be conducted by a laboratory approved by the entity with primary enforcement responsibility. EPA will develop as soon as possible, in cooperation with the States and other interested parties, criteria and procedures for laboratory certification. A State with primary enforcement responsibility will have a laboratory certified by EPA pursuant to the prescribed criteria and procedures, and in turn will certify laboratories within the State.

Record-keeping requirements and reports to the State also will assist in quality control efforts.

RECORD-KEEPING

Adequate record-keeping is necessary for the proper operation and administration of a public water system. It is also important for providing information to the public, providing appropriate data for inspection and enforcement activities and providing information on which future regulations can be based. Accordingly, a new § 141.33 has been added to the regulations to require that each public water system maintain records of sample analyses and of actions to correct violations of the Primary Drinking Water Regulations.

ECONOMIC AND COST ANALYSIS

A comprehensive economics study has been made of the Interim Primary Drinking Water Regulations. This study estimates the costs of the regulations, evaluates the potential economic impact, and considers possible material and labor shortages. The results of this analysis are summarized here.

Total investment costs to community water systems to achieve compliance with these regulations are estimated to be between $1,050 and $1,765 million. It is estimated that non-community systems will invest an additional $24 million. The range of the estimate is due to uncertainty as to the design flow that will be used in installing treatment facilities. Systems not in compliance will have to consider sizing their new components to reflect average daily flow conditions, or maximum daily flow conditions in cases where system storage is not adequate.

This investment will be spread over several years. Investor-owned systems will bear about one-fourth of these costs, and publicly-owned systems the remainder. It is not anticipated that systems will have difficulty financing these capital requirements.

In annual terms, national costs are expected to be within the following ranges:

	In millions
Capital costs	$146–347
Operations and maintenance	263–262
Monitoring (routine only)	17– 36
Total	$426–645

Although these aggregate figures are large, most water consumers will not be significantly affected. For those users in systems serving 10,000 persons or more, the average annual treatment cost per capita may increase from less than $1.00 for systems requiring disinfection and lead control, to between $15 to $35 for control of turbidity and heavy metal removal. For systems serving less than 100 persons, the average annual per capita costs of disinfection, lead control and fluoride/arsenic removal are estimated to be between $2.10 and $11.80. However, if turbidity control or heavy metal removal were required in a system of this size then costs are expected to range from $52 to $237 per year per capita. EPA is aware of the serious potential economic impact on users in these small systems. However, the legislative history specifies that the regulations should be based on costs that can be reasonably afforded by large metropolitan or regional systems. Further economic evaluation of these systems is being conducted, and realistic options for these small systems are being reviewed. Options that will be under consideration include less costly treatment technologies; formation of regional systems; and use of alternative water sources. Industrial and commercial users, whether providing their own water or using public systems, are not expected to be significantly affected by these regulations.

Possible constraints to the implementation of the interim primary regulations were examined. Although there will be an increase in demand for chemicals, manpower, laboratories, and construction of treatment facilities, it is not anticipated that any of these factors will be a serious obstacle to implementation of these regulations over a reasonable time frame.

For the reasons given above, Chapter 40 of the Code of Federal Regulations is hereby amended by the addition of the following new Part 141. These regulations will take effect 18 months after promulgation.

(It is hereby certified that the economic and inflationary impacts of these regulations have been carefully evaluated in accordance with Executive Order 11821)

Dated: December 10, 1975.

RUSSELL E. TRAIN,
Administrator.

Subpart A—General

Sec.
141.1 Applicability.
141.2 Definitions.
141.3 Coverage.
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141.6 Effective date.

Subpart B—Maximum Contaminant Levels

141.11 Maximum contaminant levels for inorganic chemicals.
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Subpart C—Monitoring and Analytical Requirements

141.21 Microbiological contaminant sampling and analytical requirements.

Sec.
141.22 Turbidity sampling and analytical requirements.
141.23 Inorganic chemical sampling and analytical requirements.
141.24 Organic chemical sampling and analytical requirements.
141.27 Alternative analytical techniques.
141.28 Approved laboratories.
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Subpart D—Reporting, Public Notification, and Record-keeping

141.31 Reporting requirements.
141.32 Public notification of variances, exemptions, and non-compliance with regulations.
141.33 Record maintenance.

AUTHORITY: Secs. 1412, 1414, 1445, and 1450 of the Public Health Service Act, 88 Stat. 1660 (42 U.S.C. 300g-1, 300g-3, 300j-4, and 300j-9).

Subpart A—General

§ 141.1 Applicability.

This part establishes primary drinking water regulations pursuant to section 1412 of the Public Health Service Act, as amended by the Safe Drinking Water Act (Pub. L. 93-523); and related regulations applicable to public water systems.

§ 141.2 Definitions.

As used in this part, the term:

(a) "Act" means the Public Health Service Act, as amended by the Safe Drinking Water Act, Pub. L. 93-523.

(b) "Contaminant" means any physical, chemical, biological, or radiological substance or matter in water.

(c) "Maximum contaminant level" means the maximum permissible level of a contaminant in water which is delivered to the free flowing outlet of the ultimate user of a public water system, except in the case of turbidity where the maximum permissible level is measured at the point of entry to the distribution system. Contaminants added to the water under circumstances controlled by the user, except those resulting from corrosion of piping and plumbing caused by water quality, are excluded from this definition.

(d) "Person" means an individual, corporation, company, association, partnership, State, municipality, or Federal agency.

(e) "Public water system" means a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year. Such term includes (1) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system, and (2) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. A public water system is either a "community water system" or a "non-community water system."

(i) "Community water system" means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

(ii) "Non-community water system" means a public water system that is not a community water system.

(f) "Sanitary survey" means an on-site review of the water source, facilities, equipment, operation and maintenance of a public water system for the purpose of evaluating the adequacy of such source, facilities, equipment, operation and maintenance for producing and distributing safe drinking water.

(g) "Standard sample" means the aliquot of finished drinking water that is examined for the presence of coliform bacteria.

(h) "State" means the agency of the State government which has jurisdiction over public water systems. During any period when a State does not have primary enforcement responsibility pursuant to Section 1413 of the Act, the term "State" means the Regional Administrator, U.S. Environmental Protection Agency.

(i) "Supplier of water" means any person who owns or operates a public water system.

§ 141.3 Coverage.

This part shall apply to each public water system, unless the public water system meets all of the following conditions:

(a) Consists only of distribution and storage facilities (and does not have any collection and treatment facilities);

(b) Obtains all of its water from, but is not owned or operated by, a public water system to which such regulations apply;

(c) Does not sell water to any person; and

(d) Is not a carrier which conveys passengers in interstate commerce.

§ 141.4 Variances and exemptions.

Variances or exemptions from certain provisions of these regulations may be granted pursuant to Sections 1415 and 1416 of the Act by the entity with primary enforcement responsibility. Provisions under Part 142, *National Interim Primary Drinking Water Regulations Implementation*—subpart E (Variances) and subpart F (Exemptions)—apply where EPA has primary enforcement responsibility.

§ 141.5 Siting requirements.

Before a person may enter into a financial commitment for or initiate construction of a new public water system or increase the capacity of an existing public water system, he shall notify the State and, to the extent practicable, avoid locating part or all of the new or expanded facility at a site which:

(a) Is subject to a significant risk from earthquakes, floods, fires or other disasters which could cause a breakdown of the public water system or a portion thereof; or

(b) Except for intake structures, is within the floodplain of a 100-year flood or is lower than any recorded high tide where appropriate records exist.

The U.S. Environmental Protection Agency will not seek to override land use decisions affecting public water systems siting which are made at the State or local government levels.

§ 141.6 Effective date.

The regulations set forth in this part shall take effect 18 months after the date of promulgation.

Subpart B—Maximum Contaminant Levels

§ 141.11 Maximum contaminant levels for inorganic chemicals.

(a) The maximum contaminant level for nitrate is applicable to both community water systems and non-community water systems. The levels for the other inorganic chemicals apply only to community water systems. Compliance with maximum contaminant levels for inorganic chemicals is calculated pursuant to § 141.23.

(b) The following are the maximum contaminant levels for inorganic chemicals other than fluoride:

Contaminant	*Level, milligrams per liter*
Arsenic	0.05
Barium	1.
Cadmium	0.010
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate (as N)	10.
Selenium	0.01
Silver	0.05

(c) When the annual average of the maximum daily air temperatures for the location in which the community water system is situated is the following, the maximum contaminant levels for fluoride are:

Temperature Degrees Fahrenheit	Degrees Celsius	Level, milligrams per liter
53.7 and below	12.0 and below	2.4
53.8 to 58.3	12.1 to 14.6	2.2
58.4 to 63.8	14.7 to 17.6	2.0
63.9 to 70.6	17.7 to 21.4	1.8
70.7 to 79.2	21.5 to 26.2	1.6
79.3 to 90.5	26.3 to 32.5	1.4

§ 141.12 Maximum contaminant levels for organic chemicals.

The following are the maximum contaminant levels for organic chemicals. They apply only to community water systems. Compliance with maximum contaminant levels for organic chemicals is calculated pursuant to § 141.24.

	Level, milligrams per liter
(a) Chlorinated hydrocarbons:	
Endrin (1,2,3,4,10, 10-hexachloro-6,7-epoxy-1,4, 4a,5,6,7,8,8a-octahydro-1,4-endo, endo-5,8 - dimethano naphthalene).	0.0002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer).	0.004
Methoxychlor (1,1,1-Trichloro-2, 2 - bis (p-methoxyphenyl) ethane).	0.1
Toxaphene ($C_{10}H_{10}Cl_8$-Technical chlorinated camphene, 67-69 percent chlorine).	0.005

(b) Chlorophenoxys:	
2,4-D, (2,4-Dichlorophenoxyacetic acid).	0.1
2,4,5-TP Silvex (2,4,5-Trichlorophenoxypropionic acid).	0.01

§ 141.13 Maximum contaminant levels for turbidity.

The maximum contaminant levels for turbidity are applicable to both community water systems and non-community water systems using surface water sources in whole or in part. The maximum contaminant levels for turbidity in drinking water, measured at a representative entry point(s) to the distribution system, are:

(a) One turbidity unit (TU), as determined by a monthly average pursuant to § 141.22, except that five or fewer turbidity units may be allowed if the supplier of water can demonstrate to the State that the higher turbidity does not do any of the following:

(1) Interfere with disinfection;

(2) Prevent maintenance of an effective disinfectant agent throughout the distribution system; or

(3) Interfere with microbiological determinations.

(b) Five turbidity units based on an average for two consecutive days pursuant to § 141.22.

§ 141.14 Maximum microbiological contaminant levels.

The maximum contaminant levels for coliform bacteria, applicable to community water systems and non-community water systems, are as follows:

(a) When the membrane filter technique pursuant to § 141.21(a) is used, the number of coliform bacteria shall not exceed any of the following:

(1) One per 100 milliliters as the arithmetic mean of all samples examined per month pursuant to § 141.21 (b) or (c);

(2) Four per 100 milliliters in more than one sample when less than 20 are examined per month; or

(3) Four per 100 milliliters in more than five percent of the samples when 20 or more are examined per month.

(b)(1) When the fermentation tube method and 10 milliliter standard portions pursuant to § 141.21(a) are used, coliform bacteria shall not be present in any of the following:

(i) more than 10 percent of the portions in any month pursuant to § 141.21 (b) or (c);

(ii) three or more portions in more than one sample when less than 20 samples are examined per month; or

(iii) three or more portions in more than five percent of the samples when 20 or more samples are examined per month.

(2) When the fermentation tube method and 100 milliliter standard portions pursuant to § 141.21(a) are used, coliform bacteria shall not be present in any of the following:

(i) more than 60 percent of the portions in any month pursuant to § 141.21 (b) or (c);

(ii) five portions in more than one sample when less than five samples are examined per month; or

(iii) five portions in more than 20 percent of the samples when five or more samples are examined per month.

(c) For community or non-community systems that are required to sample at a rate of less than 4 per month, compliance with paragraphs (a), (b)(1), or (b)(2) of this section shall be based upon sampling during a 3 month period, except that, at the discretion of the State, compliance may be based upon sampling during a one-month period.

Subpart C—Monitoring and Analytical Requirements

§ 141.21 Microbiological contaminant sampling and analytical requirements.

(a) Suppliers of water for community water systems and non-community water systems shall analyse for coliform bacteria for the purpose of determining compliance with § 141.14. Analyses shall be conducted in accordance with the analytical recommendations set forth in "Standard Methods for the Examination of Water and Wastewater," American Public Health Association, 13th Edition, pp. 662–688, except that a standard sample size shall be employed. The standard sample used in the membrane filter procedure shall be 100 milliliters. The standard sample used in the 5 tube most probable number (MPN) procedure (fermentation tube method) shall be 5 times the standard portion. The standard portion is either 10 milliliters or 100 milliliters as described in § 141.14 (b) and (c). The samples shall be taken at points which are representative of the conditions within the distribution system.

(b) The supplier of water for a community water system shall take coliform density samples at regular time intervals, and in number proportionate to the population served by the system. In no event shall the frequency be less than as set forth below:

Population served:	*Minimum number of samples per month*
25 to 1,000	1
1,001 to 2,500	2
2,501 to 3,300	3
3,301 to 4,100	4
4,101 to 4,900	5
4,901 to 5,800	6
5,801 to 6,700	7
6,701 to 7,600	8
7,601 to 8,500	9
8,501 to 9,400	10
9,401 to 10,300	11
10,301 to 11,100	12
11,101 to 12,000	13
12,001 to 12,900	14
12,901 to 13,700	15
13,701 to 14,600	16
14,601 to 15,500	17
15,501 to 16,300	18
16,301 to 17,200	19
17,201 to 18,100	20
18,101 to 18,900	21
18,901 to 19,800	22
19,801 to 20,700	23
20,701 to 21,500	24
21,501 to 22,300	25
22,301 to 23,200	26
23,201 to 24,000	27
24,001 to 24,900	28
24,901 to 25,000	29
25,001 to 28,000	30
28,001 to 33,000	35
33,001 to 37,000	40
37,001 to 41,000	45
41,001 to 46,000	50
46,001 to 50,000	55
50,001 to 54,000	60
54,001 to 59,000	65
59,001 to 64,000	70
64,001 to 70,000	75
70,001 to 76,000	80
76,001 to 83,000	85
83,001 to 90,000	90
90,001 to 96,000	95
96,001 to 111,000	100
111,001 to 130,000	110
130,001 to 160,000	120
160,001 to 190,000	130
190,001 to 220,000	140
220,001 to 250,000	150
250,001 to 290,000	160
290,001 to 320,000	170
320,001 to 360,000	180
360,001 to 410,000	190
410,001 to 450,000	200
450,001 to 500,000	210
500,001 to 550,000	220
550,001 to 600,000	230
600,001 to 660,000	240
660,001 to 720,000	250
720,001 to 780,000	260
780,001 to 840,000	270
840,001 to 910,000	280
910,001 to 970,000	290
970,001 to 1,050,000	300
1,050,001 to 1,140,000	310
1,140,001 to 1,230,000	320
1,230,001 to 1,320,000	330
1,320,001 to 1,420,000	340
1,420,001 to 1,520,000	350
1,520,001 to 1,630,000	360
1,630,001 to 1,730,000	370
1,730,001 to 1,850,000	380
1,850,001 to 1,970,000	390
1,970,001 to 2,060,000	400
2,060,001 to 2,270,000	410
2,270,001 to 2,510,000	420
2,510,001 to 2,750,000	430
2,750,001 to 3,020,000	440
3,020,001 to 3,320,000	450
3,320,001 to 3,620,000	460
3,620,001 to 3,960,000	470
3,960,001 to 4,310,000	480
4,310,001 to 4,690,000	490
4,690,001 or more	500

Based on a history of no coliform bacterial contamination and on a sanitary survey by the State showing the water system to be supplied solely by a protected ground water source and free of sanitary defects, a community water system serving 25 to 1,000 persons, with written permission from the State, may reduce this sampling frequency except that in no case shall it be reduced to less than one per quarter.

(c) The supplier of water for a non-community water system shall sample for coliform bacteria in each calendar quarter during which the system provides water to the public. Such sampling shall begin within two years after the effective date of this part. If the State, on the basis of a sanitary survey, determines that some other frequency is more appropriate, that frequency shall be the frequency required under these regulations. Such frequency shall be confirmed or changed on the basis of subsequent surveys.

(d)(1) When the coliform bacteria in a single sample exceed four per 100 milliliters (§ 141.14(a)), at least two consecutive daily check samples shall be collected and examined from the same sampling point. Additional check samples shall be collected daily, or at a frequency established by the State, until the results obtained from at least two consecutive check samples show less than one coliform bacterium per 100 milliliters.

(2) When coliform bacteria occur in three or more 10 ml portions of a single sample (§ 141.14(b)(1)), at least two consecutive daily check samples shall be collected and examined from the same sampling point. Additional check samples shall be collected daily, or at a frequency established by the State, until the results obtained from at least two consecutive check samples show no positive tubes.

(3) When coliform bacteria occur in all five of the 100 ml portions of a single sample (§ 141.14(b)(2)), at least two daily check samples shall be collected and examined from the same sampling point. Additional check samples shall be collected daily, or at a frequency established by the State, until the results obtained from at least two consecutive check samples show no positive tubes.

(4) The location at which the check samples were taken pursuant to paragraphs (d) (1), (2), or (3) of this section shall not be eliminated from future sampling without approval of the State. The results from all coliform bacterial analyses performed pursuant to this subpart, except those obtained from check samples and special purpose samples, shall be used to determine compliance with the maximum contaminant level for coliform bacteria as established in § 141.14. Check samples shall not be included in calculating the total number of samples taken each month to determine compliance with § 141.21 (b) or (c).

(e) When the presence of coliform bacteria in water taken from a particular sampling point has been confirmed by any check samples examined as directed in paragraphs (d) (1), (2), or (3) of this section, the supplier of water shall report to the State within 48 hours.

(f) When a maximum contaminant level set forth in paragraphs (a), (b) or (c) of § 141.14 is exceeded, the supplier of water shall report to the State and notify the public as prescribed in § 141.31 and § 141.32.

(g) Special purpose samples, such as those taken to determine whether disinfection practices following pipe placement, replacement, or repair have been sufficient, shall not be used to determine compliance with § 141.14 or § 141.21 (b) or (c).

(h) A supplier of water of a community water system or a non-community water system may, with the approval of the State and based upon a sanitary survey, substitute the use of chlorine residual monitoring for not more than 75 percent of the samples required to be taken by paragraph (b) of this section, *Provided*, That the supplier of water takes chlorine residual samples at points which are representative of the conditions within the distribution system at the frequency of at least four for each substituted microbiological sample. There shall be at least daily determinations of chlorine residual. When the supplier of water exercises the option provided in this paragraph (h) of this section, he shall maintain no less than 0.2 mg/l free chlorine throughout the public water distribution system. When a particular sampling point has been shown to have a free chlorine residual less than 0.2 mg/l, the water at that location shall be retested as soon as practicable and in any event within one hour. If the original analysis is confirmed, this fact shall be reported to the State within 48 hours. Also, if the analysis is confirmed, a sample for coliform bacterial analysis must be collected from that sampling point as soon as practicable and preferably within one hour, and the results of such analysis reported to the State within 48 hours after the results are known to the supplier of water. Analyses for residual chlorine shall be made in accordance with "Standard Methods for the Examination of Water and Wastewater," 13th Ed., pp. 129–132. Compliance with the maximum contaminant levels for coliform bacteria shall be determined on the monthly mean or quarterly mean basis specified in § 141.14, including those samples taken as a result of failure to maintain the required chlorine residual level. The State may withdraw its approval of the use of chlorine residual substitution at any time.

§ 141.22 Turbidity sampling and analytical requirements.

(a) Samples shall be taken by suppliers of water for both community water systems and non-community water systems at a representative entry point(s) to the water distribution system at least once per day, for the purpose of making turbidity measurements to determine compliance with § 141.13. The measurement shall be made by the Nephelometric Method in accordance with the recommendations set forth in "Standard Methods for the Examination of Water and Wastewater," American Public Health Association, 13th Edition, pp. 350–353, or "Methods for Chemical Analysis of Water and Wastes," pp. 295–298, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974.

(b) If the result of a turbidity analysis indicates that the maximum allowable limit has been exceeded, the sampling and measurement shall be confirmed by resampling as soon as practicable and preferably within one hour. If the repeat sample confirms that the maximum allowable limit has been exceeded, the supplier of water shall report to the State within 48 hours. The repeat sample shall be the sample used for the purpose of calculating the monthly average. If the monthly average of the daily samples exceeds the maximum allowable limit, or if the average of two samples taken on consecutive days exceeds 5 TU, the supplier of water shall report to the State and notify the public as directed in § 141.31 and § 141.32.

(c) Sampling for non-community water systems shall begin within two years after the effective date of this part.

(d) The requirements of this § 141.22 shall apply only to public water systems which use water obtained in whole or in part from surface sources.

§ 141.23 Inorganic chemical sampling and analytical requirements.

(a) Analyses for the purpose of determining compliance with § 141.11 are required as follows:

(1) Analyses for all community water systems utilizing surface water sources shall be completed within one year following the effective date of this part. These analyses shall be repeated at yearly intervals.

(2) Analyses for all community water systems utilizing only ground water sources shall be completed within two years following the effective date of this part. These analyses shall be repeated at three-year intervals.

(3) For non-community water systems, whether supplied by surface or ground water sources, analyses for nitrate shall be completed within two years following the effective date of this part. These analyses shall be repeated at intervals determined by the State.

(b) If the result of an analysis made pursuant to paragraph (a) indicates that the level of any contaminant listed in § 141.11 exceeds the maximum contaminant level, the supplier of water shall report to the State within 7 days and initiate three additional analyses at the same sampling point within one month.

(c) When the average of four analyses made pursuant to paragraph (b) of this section, rounded to the same number of significant figures as the maximum contaminant level for the substance in question, exceeds the maximum contaminant level, the supplier of water shall notify the State pursuant to § 141.31 and give notice to the public pursuant to § 141.32. Monitoring after public notification shall be at a frequency designated by the State and shall continue until the maximum contaminant level has not been exceeded in two successive samples or until a monitoring schedule as a condition to a variance, exemption or enforcement action shall become effective.

(d) The provisions of paragraphs (b) and (c) of this section notwithstanding, compliance with the maximum contaminant level for nitrate shall be determined on the basis of the mean of two analyses. When a level exceeding the maximum contaminant level for nitrate is found, a second analysis shall be initiated within 24 hours, and if the mean of the two analyses exceeds the maximum contaminant level, the supplier of water shall report his findings to the State pursuant to § 141.31 and shall notify the public pursuant to § 141.32.

(e) For the initial analyses required by paragraph (a)(1), (2) or (3) of this section, data for surface waters acquired within one year prior to the effective date and data for ground waters acquired within 3 years prior to the effective date of this part may be substituted at the discretion of the State.

(f) Analyses conducted to determine compliance with § 141.11 shall be made in accordance with the following methods:

(1) Arsenic—Atomic Absorption Method, "Methods for Chemical Analysis of Water and Wastes," pp. 95–96, Environ-

mental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974.

(2) Barium—Atomic Absorption Method, "Standard Methods for the Examination of Water and Wastewater," 13th Edition, pp. 210–215, or "Methods for Chemical Analysis of Water and Wastes," pp. 97–98, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974.

(3) Cadmium—Atomic Absorption Method, "Standard Methods for the Examination of Water and Wastewater," 13th Edition, pp. 210–215, or "Methods for Chemical Analysis of Water and Wastes," pp. 101–103, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974.

(4) Chromium—Atomic Absorption Method, "Standard Methods for the Examination of Water and Wastewater," 13th Edition, pp. 210–215, or "Methods for Chemical Analysis of Water and Wastes," pp. 105–106, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974.

(5) Lead—Atomic Absorption Method, "Standard Methods for the Examination of Water and Wastewater," 13th Edition, pp. 210–215, or "Methods for Chemical Analysis of Water and Wastes," pp. 112–113, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974.

(6) Mercury—Flameless Atomic Absorption Method, "Methods for Chemical Analysis of Water and Wastes," pp. 118–126, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974.

(7) Nitrate—Brucine Colorimetric Method, "Standard Methods for the Examination of Water and Wastewater," 13th Edition, pp. 461–464, or Cadmium Reduction Method, "Methods for Chemical Analysis of Water and Wastes," pp. 201–206, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974.

(8) Selenium—Atomic Absorption Method, "Methods for Chemical Analysis of Water and Wastes," p. 145, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974.

(9) Silver—Atomic Absorption Method, "Standard Methods for the Examination of Water and Wastewater", 13th Edition, pp. 210–215, or "Methods for Chemical Analysis of Water and Wastes", p. 146, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974.

(10) Fluoride—Electrode Method, "Standard Methods for the Examination of Water and Wastewater", 13th Edition, pp. 172–174, or "Methods for Chemical Analysis of Water and Wastes," pp. 65–67, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974, or Colorimetric Method with Preliminary Distillation, "Standard Methods for the Examination of Water and Wastewater," 13th Edition, pp. 171–172 and 174–176, or "Methods for Chemical Analysis of Water and Wastes," pp. 59–60, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974.

§ 141.24 Organic chemical sampling and analytical requirements.

(a) An analysis of substances for the purpose of determining compliance with § 141.12 shall be made as follows:

(1) For all community water systems utilizing surface water sources, analyses shall be completed within one year following the effective date of this part. Samples analyzed shall be collected during the period of the year designated by the State as the period when contamination by pesticides is most likely to occur. These analyses shall be repeated at intervals specified by the State but in no event less frequently than at three year intervals.

(2) For community water systems utilizing only ground water sources, analyses shall be completed by those systems specified by the State.

(b) If the result of an analysis made pursuant to paragraph (a) of this section indicates that the level of any contaminant listed in § 141.12 exceeds the maximum contaminant level, the supplier of water shall report to the State within 7 days and initiate three additional analyses within one month.

(c) When the average of four analyses made pursuant to paragraph (b) of this section, rounded to the same number of significant figures as the maximum contaminant level for the substance in question, exceeds the maximum contaminant level, the supplier of water shall report to the State pursuant to § 141.31 and give notice to the public pursuant to § 141.32. Monitoring after public notification shall be at a frequency designated by the State and shall continue until the maximum contaminant level has not been exceeded in two successive samples or until a monitoring schedule as a condition to a variance, exemption or enforcement action shall become effective.

(d) For the initial analysis required by paragraph (a) (1) and (2) of this section, data for surface water acquired within one year prior to the effective date of this part and data for ground water acquired within three years prior to the effective date of this part may be substituted at the discretion of the State.

(e) Analyses made to determine compliance with § 141.12(a) shall be made in accordance with "Method for Organochlorine Pesticides in Industrial Effluents," MDQARL, Environmental Protection Agency, Cincinnati, Ohio, November 28, 1973.

(f) Analyses made to determine compliance with § 141.12(b) shall be conducted in accordance with "Methods for Chlorinated Phenoxy Acid Herbicides in Industrial Effluents," MDQARL, Environmental Protection Agency, Cincinnati, Ohio, November 28, 1973.

§ 141.27 Alternative analytical techniques.

With the written permission of the State, concurred in by the Administrator of the U.S. Environmental Protection Agency, an alternative analytical technique may be employed. An alternative technique shall be aceeptable only if it is substantially equivalent to the prescribed test in both precision and accuracy as it relates to the determination of compliance with any maximum contaminant level. The use of the alternative analytical technique shall not decrease the frequency of monitoring required by this part.

§ 141.28 Approved laboratories.

For the purpose of determining compliance with § 141.21 through § 141.27, samples may be considered only if they have been analyzed by a laboratory approved by the State except that measurements for turbidity and free chlorine residual may be performed by any person acceptable to the State.

§ 141.29 Monitoring of consecutive public water systems.

When a public water system supplies water to one or more other public water systems, the State may modify the monitoring requirements imposed by this part to the extent that the interconnecion of the sysems jusifies treating them as a single system for monitoring purposes. Any modified monitoring shall be conducted pursuant to a schedule specified by the State and concurred in by the Administrator of the U.S. Environmental Protection Agency.

Subpart D—Reporting, Public Notification and Record Keeping

§ 141.31 Reporting requirements.

(a) Except where a shorter reporting period is specified in this part, the supplier of water shall report to the State within 40 days following a test, measurement or analysis required to be made by this part, the results of that test, measurement or analysis.

(b) The supplier of water shall report to the State within 48 hours the failure to comply with any primary drinking water regulation (including failure to comply with monitoring requirements) set forth in this part.

(c) The supplier of water is not required to report analytical results to the State in cases where a State laboratory performs the analysis and reports the results to the State office which would normally receive such notification from the supplier.

§ 141.32 Public notification.

(a) If a community water system fails to comply with an applicable maximum contaminant level established in Subpart B, fails to comply with an applicable testing procedure established in Subpart C of this part, is granted a variance or an exemption from an applicable maximum contaminant level, fails to comply with the requirements of any schedule prescribed pursuant to a variance or exemption, or fails to perform any monitoring required pursuant to Section 1445 (a) of the Act, the supplier of water shall notify persons served by the system of the failure or grant by inclusion of a notice in the first set of water bills of the system issued after the failure or grant and in any event by written notice within three months. Such notice shall be repeated at least once every three months so long as the system's failure continues or the variance or exemption remains in effect. If the system issues water bills less frequently than quarterly, or does not issue water bills, the notice shall be made by or supplemented by another form of direct mail.

(b) If a community water system has failed to comply with an applicable maximum contaminant level, the supplier of water shall notify the public of such failure, in addition to the notification required by paragraph (a) of this section, as follows:

(1) By publication on not less than three consecutive days in a newspaper or newspapers of general circulation in the area served by the system. Such notice shall be completed within fourteen days after the supplier of water learns of the failure.

(2) By furnishing a copy of the notice to the radio and television stations serving the area served by the system. Such notice shall be furnished within seven days after the supplier of water learns of the failure.

(c) If the area served by a community water system is not served by a daily newspaper of general circulation, notification by newspaper required by paragraph (b) of this section shall instead be given by publication on three consecutive weeks in a weekly newspaper of general circulation serving the area. If no weekly or daily newspaper of general circulation serves the area, notice shall be given by posting the notice in post offices within the area served by the system.

(d) If a non-community water system fails to comply with an applicable maximum contaminant level established in Subpart B of this part, fails to comply with an applicable testing procedure established in Subpart C of this part, is granted a variance or an exemption from an applicable maximum contaminant level, fails to comply with the requirement of any schedule prescribed pursuant to a variance or exemption or fails to perform any monitoring required pursuant to Section 1445(a) of the Act, the supplier of water shall given notice of such failure or grant to the persons served by the system. The form and manner of such notice shall be prescribed by the State, and shall insure that the public using the system is adequately informed of the failure or grant.

(e) Notices given pursuant to this section shall be written in a manner reasonably designed to inform fully the users of the system. The notice shall be conspicuous and shall not use unduly technical language, unduly small print or other methods which would frustrate the purpose of the notice. The notice shall disclose all material facts regarding the subject including the nature of the problem and, when appropriate, a clear statement that a primary drinking water regulation has been violated and any preventive measures that should be taken by the public. Where appropriate, or where designated by the State, bilingual notice shall be given. Notices may include a balanced explanation of the significance or seriousness to the public health of the subject of the notice, a fair explanation of steps taken by the system to correct any problem and the results of any additional sampling.

(f) Notice to the public required by this section may be given by the State on behalf of the supplier of water.

(g) In any instance in which notification by mail is required by paragraph (a) of this section but notification by newspaper or to radio or television stations is not required by paragraph (b) of this section, the State may order the supplier of water to provide notification by newspaper and to radio and television stations when circumstances make more immediate or broader notice appropriate to protect the public health.

§ 141.33 Record maintenance.

Any owner or operator of a public water system subject to the provisions of this part shall retain on its premises or at a convenient location near its premises the following records:

(a) Records of bacteriological analyses made pursuant to this part shall be kept for not less than 5 years. Records of chemical analyses made pursuant to this part shall be kept for not less than 10 years. Actual laboratory reports may be kept, or data may be transferred to tabular summaries, provided that the following information is included:

(1) The date, place, and time of sampling, and the name of the person who collected the sample;

(2) Identification of the sample as to whether it was a routine distribution system sample, check sample, raw or process water sample or other special purpose sample;

(3) Date of analysis;

(4) Laboratory and person responsible for performing analysis;

(5) The analytical technique/method used; and

(6) The results of the analysis.

(b) Records of action taken by the system to correct violations of primary drinking water regulations shall be kept for a period not less than 3 years after the last action taken with respect to the particular violation involved.

(c) Copies of any written reports, summaries or communications relating to sanitary surveys of the system conducted by the system itself, by a private consultant, or by any local, State or Federal agency, shall be kept for a period not less than 10 years after completion of the sanitary survey involved.

(d) Records concerning a variance or exemption granted to the system shall be kept for a period ending not less than 5 years following the expiration of such variance or exemption.

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PART II:

ENVIRONMENTAL PROTECTION AGENCY

■

DRINKING WATER REGULATIONS

Radionuclides

Title 40—Protection of Environment

CHAPTER 1—ENVIRONMENTAL PROTECTION AGENCY

[FRL 552 2]

PART 141—INTERIM PRIMARY DRINKING WATER REGULATIONS

Promulgation of Regulations on Radionuclides

On August 14, 1975, the Environmental Protection Agency (EPA) proposed national interim primary drinking water regulations for radioactivity pursuant to sections 1412, 1445, and 1450 of the Public Health Service Act ("the Act"), as amended by the Safe Drinking Water Act, Pub. L. 93–523, 40 FR 34324. Numerous written comments on the proposed regulations were received, and a public hearing was held in Washington on September 10, 1975.

The regulations for radioactivity are hereby promulgated in final form. A number of changes have been made in the proposed regulations in response to comments received. These changes represent efforts to clarify what are necessarily technical and complex provisions and to make monitoring requirements more realistic. The proposed maximum contaminant levels for radionuclides have been retained as proposed.

The comments received on the proposed regulations and EPA's response to those comments are discussed in detail in Appendix A. The promulgated radionuclides regulations and Appendix A should be read in the context of the national interim primary drinking water regulations as a whole. The regulations concerning microbiological, chemical and physical maximum contaminant levels, and related regulations dealing with public notification of violations and reports and record-keeping by public water systems, were promulgated on December 24, 1975, 40 FR 59566.

The balance of this preamble discusses briefly the five major issues highlighted in the preamble to the proposed radionuclides regulations, and lists in summary form the changes made in the proposed regulations.

The preamble of the proposed regulations listed five issues on which comment was particularly requested:

1. The number and location of the public water systems impacted by the proposed maximum contaminant levels for radionuclides.

2. The number and location of water supplies requiring radium analysis at the proposed 2 pCi/liter gross-alpha-particle-activity screening level.

3. The estimated preliminary assessments of the costs and technology for radium removal.

4. The validity and appropriateness of an aggregate dose method for setting maximum contaminant levels.

5. The acceptability of a maximum contaminant level for radium of 5 pCi/liter as opposed to a higher or lower level.

Public Water Systems Impacted: Little significant information was provided with respect to the number of community water systems that may exceed the proposed maximum contaminant levels. The State of Texas did report that 15 community water systems in that State would exceed the 5 pCi limit for radium: EPA estimated in the preamble to the proposed regulations that a total of approximately 500 of the Nation's community water systems would exceed the proposed radium limit. It is likely that relatively few community water systems currently exceed the proposed maximum contaminant levels for either gross alpha particle activity or man-made radioactivity. Those levels are intended as preventative limits rather than as corrective limits.

Public Water Systems Requiring Radium Analysis: The monitoring requirements for the radium maximum contaminant level provide for an initial screening measurement of gross alpha particle activity to determine if analysis for radium-226 is needed. EPA requested comment on the number and location of community water systems that would exceed the proposed screening level of 2 pCi/l. A number of comments were received on the possible impact of the proposed screening level. The principal concern expressed was that a 2 pCi/liter screening level was unnecessarily low and would force a large number of public water systems to conduct expensive radium analyses in cases where the radium limit was not being exceeded.

A number of commentors were under the impression that radium daughter products were in equilibrium with radium in drinking water so that their accompanying alpha particle activity would be an indication of radium. Monitoring data from many public water systems indicates that because of differences in solubility and geological processes, the alpha particle activity is frequently much lower than would be observed for an equilibrium mixture of radium and daughter products and sometimes may be no greater than that due to radium-226 alone.

EPA agrees that in many cases adequate protection can be obtained with a screening level higher than 2 pCi/liter provided that the precision of the measurement is great enough to insure that the gross alpha activity is unlikely to exceed 5 pCi/l. The regulations have been amended accordingly. The effect of this change is that a screening test, in lieu of radium analysis, is permitted for most systems having gross alpha particle activities as high as 4 pCi/l. However, as noted in the Statement of Basis and Purpose for the proposed radionuclide regulations, care should be taken in evaluating the results of the screening test because the alpha particle activity screen does not measure radium-228, a beta emitter. For this reason, EPA recommends that, in localities where radium-228 may be present in significant quantities, the State establish a screening level no greater than 2 pCi/liter.

Costs and Technology for Radium Removal: One comment on radium removal costs stated that the EPA cost estimates may be too high because new technologies for radium removal are being developed. Another comment stated that the EPA estimates appear "reasonable at this time," and a third that the estimates are "too general" in that system size was not considered.

As discussed in the Statement of Basis and Purpose for the proposed radionuclides regulations, costs for radium removal were found to be essentially independent of system size for systems treating less than three million gallons per day. Since there are no data indicating that the maximum contaminant level for radium is being exceeded in systems larger than this, the EPA cost estimates are valid.

Three commentors thought the cost projections for radium removal might be low because disposal of radium wastes was not considered. The Agency is presently conducting a research study to investigate disposal costs. Compared to industrial effluents containing radium, the amount of radium involved is quite small. The only available data indicate that a commercial waste disposal service for radioactive materials would be expected to cost about 50 cents annually per person served for radium disposal. However, costs will vary depending on locality and the disposal method used. It should also be noted that any radium disposal problems generated by the proposed regulations will not be unlike those already encountered by the many communities already removing radium as part of their water softening processing.

Other comments suggested consideration of occupational exposure to radium in water treatment plants. The Agency has made a limited examination of the levels of radiation in the vicinity of ion exchange units used to remove radium in operating water treatment plants. Exposure levels to operating personnel are measurable and occupational exposures could range up to 25–100 mrem/yr. These doses are well below the Federal occupational guides for radiation workers of 5000 mrem/yr. Appropriate Federal Radiation Guidance will be provided if future studies indicate the problem of occupational exposure to treatment plant personnel is serious.

One commentor questioned the efficiency of radium removal by ion exchange used in the cost analysis in Appendix V of the Statement of Basis and Purpose. That analysis shows that treatment cost is relatively independent of radium removal efficiency as long as removal exceeds 90 percent. Operating data from currently used municipal water treatment systems indicate that average radium removal efficiency throughout the exchange cycle ranges from 93 to 97 percent.

Aggregate Dose Level: As noted in the preamble to the proposed radionuclides regulations, 40 FR 34325, EPA considered but rejected the use of an aggregate dose level in establishing maximum contaminant levels. This approach would consider both the risk to individuals and the total risk to the population served, so that the maximum contaminant level would be inversely related, within limits, to the size of the exposed population group. Comments on the concept of aggregate dose levels overwhelmingly endorsed EPA's decision not to use that approach in the development of maximum levels under the Safe Drinking Water Act.

Maximum Contaminant Level for Radium: A number of States submitted comments on EPA's proposal to establish the maximum contaminant level for radium at 5 pCi/liter. One State suggested that a limit of 10 pCi/liter be established for small public water systems. This suggestion has not been accepted by EPA because the legislative history of the Safe Drinking Water Act indicates that, to the extent possible, all persons served by public water systems should be protected by the same maximum contaminant levels. A number of other States expressed concurrence in the 5 pCi/liter limit.

One commentor cited the results of a U.S. Public Health Service study that indicated that persons in communities with water having a concentration of 4.7 pCi/liter had a higher mortality incidence due to bone sarcoma than persons in communities with water having less than 1 pCi/liter. The commentor contended that the USPHS study did not show a significant difference in cancer risk at a 95 percent confidence level, and that in any event the number of excess cancers was significantly less than would be predicted on the basis of the NAS-BEIR Report.

EPA notes that the confidence level of the USPHS study was 92 percent which is not significantly different from a 95 percent criterion considering the overall precision of the USPHS study. Mortality estimates on which the 5 pCi/liter limit was based included all cancers, not just bone sarcoma. Moreover, the EPA estimates are for lifetime exposures, whereas most of the participants in the USPHS study were exposed for a substantially shorter period of time. Moreover, the incidence of cancer observed in the USPHS study is somewhat greater than would be predicted by the linear dose response model used by EPA, not less as suggested by the commentor. Given these facts it is EPA's view that the USPHS study supports its use of risk estimates from ingested radium as a valid measure of the impact of various control levels. EPA will, however, study new cancer incidence data as they become available to determine whether the 5 pCi/liter level provides appropriate protection.

Changes Made in the Proposed Regulations:

In response to comments received on the proposed regulations, a number of changes have been made. The comments and changes are discussed in some detail in Appendix A. The following list summarizes changes which have been made:

1. Section 141.2 has been revised to simplify the definitions of "gross alpha particle activity" and "gross beta particle activity." As proposed these definitions were confusing because they sought to make distinctions which were more properly set forth in §§ 141.15 and 141.16.

2. Section 141.15 has been changed to make clear that the maximum contaminant level for gross alpha particle activity does not apply to isotopes of uranium and radon.

3. Section 141.16 has been redrafted for clarity and provisions relating to the means of determining compliance have been moved to § 141.26. It should be noted that the average annual concentration of strontium-90 yielding 4 mrem per year to bone marrow is 8 pCi/1 not 2 pCi/1 as was stated in the Proposed Regulations. Accordingly, Table A in Section 141.16 has been corrected and the detection limit for strontium-90 listed in Table B, § 141.25 has been changed to 2pCi/1.

4. Section 141.25 has been revised to include newer analytical methods and to delete some obsolescent methods. The definition of detection limit has been changed to indicate clearly that it applies only to uncertainty in the precision of the measurement due to counting errors. Also, a new detection limit of 4 pCi/liter has been established for gross beta particle activity so that gross beta analysis may be substituted for strontium-89 and cesium-134 analyses in some cases. It should be noted that under § 141.27 the State, with the concurrence of the Administrator, may authorize the use of alternative analytical methods having the same precision and accuracy as those listed in §§ 141.25 and 141.26.

5. Section 141.26 has been redrafted for clarity and the alpha particle activity screening level has been redefined to provide a higher gross alpha screening limit as long as the precision of measurement insures that the gross alpha activity is unlikely to exceed 5 pCi/1. Also, the requirement for quarterly sampling has been revised to permit a yearly sample where a one-year record based on quarterly sampling has indicated the average annual gross alpha particle activity and radium-226 activity to be less than half the applicable maximum contaminant level. The period allowed for initial monitoring has been extended to three years rather than two years after the effective date of these regulations. Also, rather than require that subsequent monitoring be every three years for ground water and every five years for surface water, monitoring for both ground water and surface water will be required every four years.

6. Section 141.26 has been amended to provide that, when ordered by the State, a community water system will be required to participate in a watershed monitoring program for man-made radioactivity. EPA recommends that States require such programs in each principal watershed under their jurisdiction. In addition, the provision allowing the use of discharge data from nuclear facilities in lieu of special monitoring for man-made radioactivity has been amended to allow only the use of environmental surveillance data taken in conjunction with the State. Also in § 141.26 a screening level for gross beta particle activity has been established to reduce the cost of monitoring water systems affected by nuclear facilities.

If any screening levels for gross beta particle activity are exceeded, identification of specific radionuclides is mandatory prior to public notification and initiation of any enforcement action. In addition to the gross beta particle activity measurement, it may be necessary, as new energy technologies become available in the future, to monitor for specific man-made contaminants other than those currently identified. The Act provides that these regulations may be amended from time to time.

EFFECTIVE DATE

Section 1412(a)(3) of the Act provides that "The interim primary regulations first promulgated * * * shall take effect eighteen months after the date of their promulgation." The interim primary regulations first promulgated were those for microbiological, chemical and physical contaminants. They were promulgated on December 24, 1975, and will become effective June 24, 1977. Because it is desirable that all of the basic interim primary drinking water regulations take effect on the same date, and in view of the long lead time provided to public water systems for compliance with these radionuclide regulations, the radionuclide regulations also will become effective on June 24, 1977.

It is hereby certified that the economic and inflationary impacts of these regulations have been carefully evaluated in accordance with Executive Order 11821, and it has been determined that an Inflation Impact Statement is not required. (The estimated ten million dollar annual cost is less than the one-hundred million dollar annual cost cut-off established as the minimum for which an Inflation Impact Statement is required.)

For the reasons given above, Part 141, Chapter 40 of the Code of Federal Regulations is hereby amended as follows:

RUSSELL TRAIN,
Administrator.

JUNE 28, 1976.

1. By revising § 141.2 to include the following new paragraphs (j) through (o):

§ 141.2 Definitions.

* * * * *

(j) "Dose equivalent" means the product of the absorbed dose from ionizing radiation and such factors as account for differences in biological effectiveness due to the type of radiation and its distribution in the body as specified by the International Commission on Radiological Units and Measurements (ICRU).

(k) "Rem" means the unit of dose equivalent from ionizing radiation to the total body or any internal organ or organ system. A "millirem (mrem)" is 1/1000 of a rem.

(l) "Picocurie (pCi)" means that quantity of radioactive material producing 2.22 nuclear transformations per minute.

(m) "Gross alpha particle activity" means the total radioactivity due to

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alpha particle emission as inferred from measurements on a dry sample.

(n) "Man-made beta particle and photon emitters" means all radionuclides emitting beta particles and/or photons listed in Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure, NBS Handbook 69, except the daughter products of thorium-232, uranium-235 and uranium-238.

(o) "Gross beta particle activity" means the total radioactivity due to beta particle emission as inferred from measurements on a dry sample.

2. By adding §§ 141.15, 141.16, 141.25 and 141.26 as follows:

§ 141.15 Maximum contaminant levels for radium-226, radium-228, and gross alpha particle radioactivity in community water systems.

The following are the maximum contaminant levels for radium-226, radium-228, and gross alpha particle radioactivity:

(a) Combined radium-226 and radium-228—5 pCi/1.

(b) Gross alpha particle activity (including radium-226 but excluding radon and uranium)—15 pCi/1.

§ 141.16 Maximum contaminant levels for beta particle and photon radioactivity from man-made radionuclides in community water systems.

(a) The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year.

(b) Except for the radionuclides listed in Table A, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents shall be calculated on the basis of a 2 liter per day drinking water intake using the 168 hour data listed in "*Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure,*" NBS Handbook 69 as amended August 1963, U.S. Department of Commerce. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 millirem/year.

TABLE A.—*Average annual concentrations assumed to produce a total body or organ dose of 4 mrem/yr*

Radionuclide	Critical organ	pCi per liter
Tritium	Total body	20,000
Strontium-90	Bone marrow	8

§ 141.25 Analytical Methods for Radioactivity.

(a) The methods specified in *Interim Radiochemical Methodology for Drinking Water*, Environmental Monitoring and Support Laboratory, EPA-600/4-75-008, USEPA, Cincinnati, Ohio 45268, or those listed below, are to be used to determine compliance with §§ 141.15 and 141.16 (radioactivity) except in cases where alternative methods have been approved in accordance with § 141.27.

(1) Gross Alpha and Beta—Method 302 "Gross Alpha and Beta Radioactivity in Water" *Standard Methods for the Examination of Water and Wastewater*, 13th Edition, American Public Health Association, New York, N.Y., 1971.

(2) Total Radium—Method 304 "Radium in Water by Precipitation" Ibid.

(3) Radium-226—Method 305 "Radium-226 by Radon in Water" Ibid.

(4) Strontium-89,90 — Method 303 "Total Strontium and Strontium-90 in Water" Ibid.

(5) Tritium—Method 306 "Tritium in Water" Ibid.

(6) Cesium-134 — ASTM D-2459 "Gamma Spectrometry in Water," *1975 Annual Book of ASTM Standards, Water and Atmospheric Analysis*, Part 31, American Society for Testing and Materials, Philadelphia, PA. (1975).

(7) Uranium—ASTM D-2907 "Microquantities of Uranium in Water by Fluorometry," Ibid.

(b) When the identification and measurement of radionuclides other than those listed in paragraph (a) is required, the following references are to be used, except in cases where alternative methods have been approved in accordance with § 141.27.

(1) *Procedures for Radiochemical Analysis of Nuclear Reactor Aqueous Solutions*, H. L. Krieger and S. Gold, EPA-R4-73-014. USEPA, Cincinnati, Ohio, May 1973.

(2) *HASL Procedure Manual*, Edited by John H. Harley. HASL 300, ERDA Health and Safety Laboratory, New York, N.Y., 1973.

(c) For the purpose of monitoring radioactivity concentrations in drinking water, the required sensitivity of the radioanalysis is defined in terms of a detection limit. The detection limit shall be that concentration which can be counted with a precision of plus or minus 100 percent at the 95 percent confidence level (1.96σ where σ is the standard deviation of the net counting rate of the sample).

(1) To determine compliance with § 141.15 (a) the detection limit shall not exceed 1 pCi/1. To determine compliance with § 141.15(b) the detection limit shall not exceed 3 pCi/1.

(2) To determine compliance with § 141.16 the detection limits shall not exceed the concentrations listed in Table B.

TABLE B.—DETECTION LIMITS FOR MAN-MADE BETA PARTICLE AND PHOTON EMITTERS

Radionuclide	*Detection limit*
Tritium	1,000 pCi/1
Strontium-89	10 pCi/1
Strontium-90	2 pCi/1
Iodine-131	1 pCi/1.
Cesium-134	10 pCi/1
Gross beta	4 pCi/1.
Other radionuclides	$\frac{1}{10}$ of the applicable limit.

(d) To judge compliance with the maximum contaminant levels listed in sections 141.15 and 141.16, averages of data shall be used and shall be rounded to the same number of significant figures as the maximum contaminant level for the substance in question.

§ 141.26 Monitoring Frequency for Radioactivity in Community Water Systems.

(a) Monitoring requirements for gross alpha particle activity, radium-226 and radium-228.

(1) Initial sampling to determine compliance with § 141.15 shall begin within two years of the effective date of these regulations and the analysis shall be completed within three years of the effective date of these regulations. Compliance shall be based on the analysis of an annual composite of four consecutive quarterly samples or the average of the analyses of four samples obtained at quarterly intervals.

(i) A gross alpha particle activity measurement may be substituted for the required radium-226 and radium-228 analysis *Provided*, That the measured gross alpha particle activity does not exceed 5 pCi/1 at a confidence level of 95 percent (1.65σ where σ is the standard deviation of the net counting rate of the sample). In localities where radium-228 may be present in drinking water, it is recommended that the State require radium-226 and/or radium-228 analyses when the gross alpha particle activity exceeds 2 pCi/1.

(ii) When the gross alpha particle activity exceeds 5 pCi/1, the same or an equivalent sample shall be analyzed for radium-226. If the concentration of radium-226 exceeds 3 pCi/1 the same or an equivalent sample shall be analyzed for radium-228.

(2) For the initial analysis required by paragraph (a)(1), data acquired within one year prior to the effective date of this part may be substituted at the discretion of the State.

(3) Suppliers of water shall monitor at least once every four years following the procedure required by paragraph (a)(1). At the discretion of the State, when an annual record taken in conformance with paragraph (a)(1) has established that the average annual concentration is less than half the maximum contaminant levels established by § 141.15, analysis of a single sample may be substituted for the quarterly sampling procedure required by paragraph (a)(1).

(i) More frequent monitoring shall be conducted when ordered by the State in the vicinity of mining or other operations which may contribute alpha particle radioactivity to either surface or ground water sources of drinking water.

(ii) A supplier of water shall monitor in conformance with paragraph (a)(1) within one year of the introduction of a new water source for a community water system. More frequent monitoring shall be conducted when ordered by the State in the event of possible contamination or when changes in the distribution system or treatment processing occur which may increase the concentration of radioactivity in finished water.

(iii) A community water system using two or more sources having different concentrations of radioactivity shall monitor source water, in addition to water from a free-flowing tap, when ordered by the State.

(iv) Monitoring for compliance with § 141.15 after the initial period need not include radium-228 *except when* required by the State, *Provided*, That the average annual concentration of radium-228 has been assayed at least once using the quarterly sampling procedure required by paragraph (a) (1).

(v) Suppliers of water shall conduct annual monitoring of any community water system in which the radium-226 concentration exceeds 3 pCi/1, when ordered by the State.

(4) If the average annual maximum contaminant level for gross alpha particle activity or total radium as set forth in § 141.15 is exceeded, the supplier of a community water system shall give notice to the State pursuant to § 141.31 and notify the public as required by § 141.32. Monitoring at quarterly intervals shall be continued until the annual average concentration no longer exceeds the maximum contaminant level or until a monitoring schedule as a condition to a variance, exemption or enforcement action shall become effective.

(b) Monitoring requirements for manmade radioactivity in community water systems.

(1) Within two years of the effective date of this part, systems using surface water sources and serving more than 100,000 persons and such other community water systems as are designated by the State shall be monitored for compliance with § 141.16 by analysis of a composite of four consecutive quarterly samples or analysis of four quarterly samples. Compliance with § 141.16 may be assumed without further analysis if the average annual concentration of gross beta particle activity is less than 50 pCi/1 and if the average annual concentrations of tritium and strontium-90 are less than those listed in Table A, *Provided*, That if both radionuclides are present the sum of their annual dose equivalents to bone marrow shall not exceed 4 millirem/year.

(i) If the gross beta particle activity exceeds 50 pCi/1, an analysis of the sample must be performed to identify the major radioactive constituents present and the appropriate organ and total body doses shall be calculated to determine compliance with § 141.16.

(ii) Suppliers of water shall conduct additional monitoring, as ordered by the State, to determine the concentration of man-made radioactivity in principal watersheds designated by the State.

(iii) At the discretion of the State, suppliers of water utilizing only ground waters may be required to monitor for man-made radioactivity.

(2) For the initial analysis required by paragraph (b) (1) data acquired within one year prior to the effective date of this part may be substituted at the discretion of the State.

(3) After the initial analysis required by paragraph (b) (1) suppliers of water shall monitor at least every four years following the procedure given in paragraph (b) (1).

(4) Within two years of the effective date of these regulations the supplier of any community water system designated by the State as utilizing waters contaminated by effluents from nuclear facilities shall initiate quarterly monitoring for gross beta particle and iodine-131 radioactivity and annual monitoring for strontium-90 and tritium.

(i) Quarterly monitoring for gross beta particle activity shall be based on the analysis of monthly samples or the analysis of a composite of three monthly samples. The former is recommended. If the gross beta particle activity in a sample exceeds 15 pCi/1, the same or an equivalent sample shall be analysed for strontium-89 and cesium-134. If the gross beta particle activity exceeds 50 pCi/1, an analysis of the sample must be performed to identify the major radioactive constituents present and the appropriate organ and total body doses shall be calculated to determine compliance with § 141.16.

(ii) For iodine-131, a composite of five consecutive daily samples shall be analyzed once each quarter. As ordered by the State, more frequent monitoring shall be conducted when iodine-131 is identified in the finished water.

(iii) Annual monitoring for strontium-90 and tritium shall be conducted by means of the analysis of a composite of four consecutive quarterly samples or analysis of four quarterly samples. The latter procedure is recommended.

(iv) The State may allow the substitution of environmental surveillance data taken in conjunction with a nuclear facility for direct monitoring of manmade radioactivity by the supplier of water where the State determines such data is applicable to a particular community water system.

(5) If the average annual maximum contaminant level for man-made radioactivity set forth in § 141.16 is exceeded, the operator of a community water system shall give notice to the State pursuant to § 141.31 and to the public as required by § 141.32. Monitoring at monthly intervals shall be continued until the concentration no longer exceeds the maximum contaminant level or until a monitoring schedule as a condition to a variance, exemption or enforcement action shall become effective.

FEASIBILITY STUDY FOR DEVELOPMENT AND IMPLEMENTATION OF A MODEL STATE INFORMATION SYSTEM FOR EPA's SAFE DRINKING WATER PROGRAM

PREPARED FOR THE OFFICE OF WATER SUPPLY

ENVIRONMENTAL PROTECTION AGENCY

June 15, 1976

PREFACE

This report presents the findings of a feasibility study for development and implementation of a model state information system for EPA's Safe Drinking Water Program. The conceptual basis for this information system is described in Program Evaluation Requirements, Concepts and Plans for the EPA Safe Drinking Water Program, Office of Water Supply, EPA, October 1975. And the general design of a customized Model State Information System is contained in four volumes supplied to EPA concurrently with this report. Details regarding the various subsystems, inputs, outputs and file structures are presented in these volumes and are therefore not repeated here.

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FEASIBILITY STUDY FOR DEVELOPMENT AND IMPLEMENTATION OF A MODEL STATE INFORMATION SYSTEM FOR EPA's SAFE DRINKING WATER PROGRAM

EXECUTIVE SUMMARY

The Safe Drinking Water Act of 1974 greatly expands the U.S. Environmental Protection Agency's responsibilities for monitoring the quality of drinking water in the United States. The Act enfolds all public water systems under the regulatory umbrella of EPA, but provides for a joint federal-state enforcement system for ensuring the quality of drinking water.

Under the authority invested in EPA by the Act, the first set of regulations entitled "National Interim Primary Drinking Water Regulations" were issued in December 1974. These regulations established maximum contaminant levels for specified contaminants and prescribed procedures for sampling and monitoring water quality beginning June 1977. Although most states already have some form of program to monitor drinking water quality, the extensive sampling and reporting requirements prescribed by EPA will significantly increase the administrative and regulatory burden at the state and federal level.

A preliminary survey of selected states in 1975 confirmed the EPA's belief that a computer-based information system would be required by most states to effectively monitor the program. Rather than have individual states embark on separate paths toward computer system development, the U.S. EPA decided to develop a Model State Information System (MSIS) to assist the states and regions in implementing the program.

A key decision in the implementation of this MSIS is whether the system should be made available to the states to operate on computer facilities of their choice, or the system be installed only at the central EPA computer facility, accessed by the states and regions through telecommunications. This analysis was undertaken to assist EPA in making this determination.

American Management Systems, Inc. (AMS) analyzed the feasibility, resource requirements and cost estimates for developing, installing, and operating the MSIS under three systems options:

- a decentralized custom MSIS developed specifically to address the minimum requirements of the Safe Drinking Water Program and made available to states to operate on a facility of their choice; the system would be supported by the central EPA facility for use by regions and states choosing the central EPA facility.

- a centralized custom MSIS developed as in option 1 but supported only at the central EPA facility, and

- a centralized MSIS based on STORET, the general purpose data storage and retrieval software used in monitoring water quality.

As an important part of the feasibility analysis, AMS visited 24 states and the 10 EPA Regional Offices. Our analysis is based on the data collected at these site visits. Following the site visits, EPA obtained critical information on state preferences and data processing capabilities through a simplified questionnaire administered by the regions to states not included in the original sample. This additional data generally supports the information collected in the survey.

As Table ES-1 shows, 31 of the 40 responding states indicated a strong preference for a decentralized system, with 22 states essentially agreeing to use an EPA developed MSIS. Most of the six states desiring a centralized MSIS stated that they do not have ready access to a state computer system.

TABLE ES-1

STATE PREFERENCES FOR MSIS

	Number of Responses
Decentralized System	
• EPA developed MSIS	22
• state developed system	6
• manual system	3
Sub-total	31
Centralized System	
• STORET-based MSIS	2
• EPA developed MSIS	4
Sub-total	6
Data not available	3
TOTAL All Responses	40

Key Findings

A vast majority of the states surveyed indicated a very strong preference for the decentralized custom MSIS. The states generally prefer to have the system under their control, especially a routine operational system for a program the states are responsible for monitoring. Individual states will undoubtedly wish to extend the use of the MSIS to suit their specific requirements; this tailoring is probably best accomplished in a decentralized system. One of EPA's major concerns regarding MSIS was the ability of state data processing capabilities to support a decentralized MSIS. Our survey and analysis indicate that by and large most states possess the ADP capability and the capacity to operate and maintain such a system. 21 of the 40 states responding to our survey reported OS based IBM facilities; 11 states reported other manufacturer's hardware, and eight were unable to provide data on their data processing capabilities. Finally, in terms of cost analysis for development and operation, our estimates show that the decentralized custom system would cost less to develop and operate.

Our estimates show that the development of the custom MSIS would cost between $183,000 and $231,000 for contracted professional services; in comparison, the STORET-based MSIS would cost about $204,000 if developed under contract with an outside vendor. The STORET group estimates development costs of about $128,000 for in-house development of a STORET-based MSIS, the major difference being in the substantially lower daily rates used. However, EPA does not have the resources to develop an MSIS in-house and the STORET group estimates a requirement for three additional people who would then need to be trained in the use of STORET.

The decentralized operation is especially attractive since it does not create a huge demand on the federal EPA for continuing system support, computer facilities, and the problems of managing a complex telecommunication-based system.

The volume of data to be processed by the MSIS is considerable (estimated daily volume of 26,000 transactions nationwide when the non-community systems are included) and if the centralized option is selected, it will result in a system roughly the size of the current STORET system of EPA's central facility.

For these reasons, we feel that the decentralized custom system will best serve the intent of the Safe Drinking Water Program. However, the development of an MSIS is a major undertaking, especially considering the time schedule imposed by the regulations -- June 1977. Continuous and effective project management will ultimately determine the success or failure of this endeavor, especially the manner in which the system is tested centrally before being delivered to the states for installation, and the initial support provided by the federal EPA to the states and regions. One of the chief reasons for the problems encountered by EPA in developing decentralized systems in the past has been the lack of adequate systems testing before installation at the state level. In order to assist the EPA to effectively manage the development, testing, and installation of MSIS, we have provided as part of this effort a detailed task plan and schedule for each step in system development.

Option 2 of the centralized custom MSIS offers no significant advantage over the decentralized option, especially since it will be almost impossible to withhold the software from a state that requests it. The administrative structure, computer facilities, and the telecommunications network require not only a significant front-end investment but also a high level of continuing effort by the federal EPA. And there is no guarantee that states will use the centralized system. Generally, a centralized data base is effective if several different users require immediate access to most recent and detailed data. In this instance, the federal EPA or other states do not need immediate access to detailed data maintained for an individual state; EPA's major role is that of providing the support needed to initiate the program and keep it functioning effectively at the state and regional level. This is best accomplished through a decentralized custom system.

The final option of using STORET to perform the data storage and retrieval functions of an MSIS also suffers from all the drawbacks outlined for the centralized system. In our judgment STORET is not suitable for a production-type management information system. It was designed to process parametric data, and performs its intended functions effectively and adequately.

To try and adapt it for an application it was not designed for surely decreases the probability of obtaining an operational system to serve the needs of the Safe Drinking Water Program. Additionally, the EPA does not currently possess the required manpower resources to develop a STORET-based MSIS. The knowledge of STORET is not a generally available commodity so even if additional persons are added to the internal staff, or the development is contracted out, there would be at least some time lag before these individuals can be comfortable enough with the STORET environment to design and develop an MSIS based on STORET. The schedule imposed by the National Interim Primary Drinking Water Regulations renders each day critical for MSIS development. The problem is further complicated by the lack of adequate documentation of the STORET software.

Thus, in balance, we feel that the decentralized custom MSIS represents EPA's best chances for a successful system; however, we once again stress the strong need for effective management of the system development if MSIS is to be ready for use by at least some states in June 1977.

Summary of Costs

An important part of analysis focused on the costs of developing, installing, and operating an MSIS under each major option. Table ES-2 summarizes MSIS development cost estimates for a custom system and the STORET-based option. Resource requirements for MSIS development (in terms of person-months) are estimated to be roughly the same for both options of the MSIS; as a result, the cost to EPA of developing the system under contract will be roughly similar under either option. The in-house development cost estimate for the STORET option is based on an internal price which does not take into account the fact that additional resources acquired for this development effort represent a cost in perpetuity to EPA.

TABLE ES-3

ESTIMATED INSTALLATION COSTS OF A MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM

	Decentralized System	Centralized System (custom and STORET options)
Estimated Person-days		
• General tasks for all states	38	38
• Average per state	55-66	49
Total Person-days for 49 installations	2,978	2,439
Estimated Cost @ $200 per day	$595,600	$487,800

Finally, our estimates for the ongoing operating costs of MSIS are displayed in Table ES-4. The table contains our estimates of required manpower as well as data input and computer operating costs for the basic package and full MSIS for the first and third year of operations. Our estimates show that for the decentralized system, EPA will need a full-time person at the center and approximately three-quarters of a full-time person at the regions. Operating costs under the decentralized system will range from an estimated $704,000 in the first year for the basic package to $2.1 million in the third year for the full package. In the long run, the full package estimates constitute more reasonable planning guides since the states will probably extend the applications of MSIS as they become more familiar with it. Centralized options are estimated to make significantly more demands on resources at EPA headquarters and regions; moreover, operating costs are estimated to be higher in the centralized options chiefly because of the administrative and technical problems in interfacing with a centralized facility.

* *

In conclusion, therefore, we find that:

- Estimated operating costs are not significantly different under any option for the MSIS,

- Systems development and installation costs would be significantly lower if EPA developed and installed the system with in-house resources; however, EPA does not have adequate resources to effectively accomplish this task,

- If the development of MSIS is contracted out, the costs of development and installation are estimated to be roughly similar under any selected option,

- Therefore, on a cost basis, no single option would provide an overriding reason for its selection.

- On the other hand, the intent of the legislation, its intent for joint federal-state enforcement, and the states' preferences and data processing capabilities argue very strongly for a decentralized custom MSIS.

INTRODUCTION TO THE
MODEL STATE INFORMATION SYSTEM (MSIS)

Prepared For The

OFFICE OF WATER SUPPLY
ENVIRONMENTAL PROTECTION AGENCY

June 15, 1976

I. OVERVIEW

The Model State Information System (MSIS) is a computer-based information system for use by individual states in managing the increased volume of water quality and related data that will be required to implement the recently promulgated National Interim Primary Drinking Water Regulations. While it is primarily designed for those states that do not currently have an automated system, it is also designed to provide enhanced capabilities to states with automated systems.

Principal Functions

States will have the option of selecting a base package of features, plus one or more optional features, depending on their volume of data and individual preferences. The system will perform the following principal functions:

Base Package

- Maintain records of each public water system in a state, containing such information as the name, address, population served, number of service connections, source of water, and treatment techniques used.
- Maintain records of samples and laboratory tests and provide detail and summary reports to state water supply managers on violations of the regulations.
- Maintain accurate and up-to-date records of regulatory requirements, such as MCLs and monitoring frequencies.
- Provide compliance data to EPA in computer compatible form on at least an annual basis.

Optional Features:

- Maintain records of compliance schedules under variance and exemption (V&E) agreements and produce reports of compliance with scheduled milestones.

- Provide a capability to automatically schedule periodic sanitary surveys based on priority factors such as population served and compliance history, in addition to date of last survey.

- Maintain records of specific enforcement actions to assist in case tracking and compliance monitoring.

- Provide a capability to manage data on certified operators and automatically print mailing labels for rapid and inexpensive communication with target populations such as water supply operators, laboratories, and local health officials.

Key Benefits

MSIS will provide states with these key benefits:

- Reduction in administrative costs of implementing the new regulations by utilizing efficient computer-based techniques rather than manual recordkeeping. Costs of manual systems increase linearly with workload; costs of computer-based systems do not.

- Greatly reduced costs of software development, training, and installation by using the EPA developed system instead of a custom built system.

- Timely and accurate reports of compliance with both Federal and state drinking water regulations.

- Positive control over sampling programs of local water suppliers with an optional, computer-initiated sample scheduling feature and appropriate audit trails.

- Better utilization of scarce technical manpower by priority targeting of state inspection programs.

- Automatic monitoring of compliance schedules under variances and exemptions.

Legal Issue

MSIS computer records and computer printed reports are not necessarily legally admissible as evidence. State laws differ in this regard; states planning to use MSIS should obtain a legal opinion from their state's chief legal officer before relying solely on computer stored information as evidence.

III. OPERATIONAL HIGHLIGHTS

The previous section described MSIS components and presented a static picture. In this section we describe MSIS as a process, beginning with how the system is set up, continuing with regular, scheduled operations, and concluding with optional, non-recurrent processing.

A. Setting-up MSIS

Before MSIS can function, its operating environment must be prepared. In general, the following steps should be followed:

1. A review, by water supply control and data processing personnel, of MSIS documentation.

2. A decision on which subsystems to implement.

3. Design and preparation of input and output forms, based on state regulations and preferences, and on form prototypes provided with MSIS documentation.

4. Programs installation. This step includes copying the MSIS programs to the states' computer programs library and verifying that they can operate on the state computer.

5. Tables preparation. This step includes preparation of code tables as required by various programs of MSIS, such as the Regulations Table (the input for the Federal regulations will be supplied as a punched cards deck), and the Laboratory Table.

6. Create initial PWS Inventory File. The first version of the PWS Inventory File (PWSIF), will be supplied by EPA on a magnetic tape which is prepared from information that exists on the National PWS Inventory File. When all the previous steps are completed, the file is listed to provide a comprehensive list of all PWS records on the file. A review of the list is required to correct, add and change the information, using the programs of the PWS Inventory Subsystem. By the end of the review period, a basic inventory file of public water systems is ready.

7. Determine operations schedule. MSIS is designed to offer the states flexibility to choose their individual operations schedules, and the final step of the set-up phase is to adopt a run schedule for each subsystem.

B. Regular Production

1. PWS Inventory Subsystem

A periodical (e.g. bi-weekly) updating of the PWSIF is all that is required as a regular production of this subsystem except during the first two years while many new non-community PWSs are being posted to the file and more frequent production may be needed.

2. The Water Quality Compliance Subsystem

a. Compliance Cycle

This subsystem is designed to be processed periodically in accordance with PWS reporting periods (typically a month or a quarter. In order to achieve an even spread of the work through the month, a state may wish to allocate PWSs into several compliance cycles, by defining the day in the month on which a PWS must report. Suppose that a state has to monitor 5000 PWSs; they may be divided equally between four cycles. By assigning the numbers - 01, 08, 15, and 22, it is known to MSIS which PWS must report on the first, second, third, and fourth week of the month. This arrangement means that for every week it is checked whether all PWSs that must have to report by that date (and allowing 10 more days for data entry) have done it.

b. Scheduling PWSs for sampling

Each week the scheduling modules scan the PWSIF and identifies PWSs required to submit sample analysis results. All the necessary reporting forms are printed and mailed to those PWSs (including sample bottles) thus notifying them in advance of the contaminants and number of samples required, and providing them with the necessary input forms. PWSs should use these forms for submitting samples for analysis and for reporting to the state.

c. Data Entry

Results of analysis are received daily from the laboratories, keyed, and entered to the system. This process has to repeat two to three times a week, depending on data volume. Following each data entry run an error report is produced, listing sample data that was rejected during data entry. This data must be checked, corrected, and reentered in the next data entry run.

d. Compliance Reporting

A periodic summary process summarizes the data that has been entered during the period and produces compliance reports showing PWSs that did not comply with sampling requirements and water quality standards (MCL). A Violation File is updated with records containing the details of these violations, and data on other violations through manual inputs. The sum of all the violations posted to the Violations File is produced in one report showing, by PWS, all violations that were detected.

e. Summary

The basic sequence of production during one reporting period is: scheduling, input of sample data, summary of sample data, and reporting. It should be noted that the character of MSIS as a batch system means that identification of violation will lag after the occurrence and so the Water Quality Compliance Subsystem cannot replace a telephone call from a laboratory.

3. Regulation Subsystem

There is no need to operate this subsystem unless there was a change in the regulations in which case the applicable input forms are filled, keyed and entered. Output reports must be carefully verified to ensure that the Regulations Table is correct and if any errors were detected, they must be corrected by repeating the process until errors are no longer detected.

4. Federal Reporting Subsystem

The regular production of this subsystem in an annual run which produces the files and reports that are required under the National Interim Primary Drinking Water Regulations.

5. Variances and Exemptions Subsystem

This is an optional feature of MSIS. The Variances and Exemptions File (VEF) is built gradually over time by entering new V&E's data to the subsystem. The production cycle will generally be monthly: data is entered and after it is cleared of errors, the two monthly reports are produced:

a. Projected Milestones

b. Late Milestones

These reports perform the function of alerting states' personnel to PWS that must report completion of a milestone and PWSs that did not do so, thus enabling the state to take proper action.

6. Sanitary Survey Subsystem

There are two distinct phases in operating this optional subsystem.

a. To establish the proper combination of parameters applied to the algorithm for surveyselection. Once the formula is found, it need not be changed unless the states approach has been changed.

b. The regular production will generally consist of a monthly production of a list of PWSs that are scheduled for sanitary survey, the results of which are used to update the PWSIF.

7. Enforcement Actions Subsystem

This is an optional feature of MSIS. When a state wishes to implement the subsystem it starts by building the Enforcement Actions File (EAF) as enforcement actions are taken. The only regular process associated with this subsystem would be monthly data entry and update; report production is only by request.

8. Operator and Mailing Subsystem

This subsystem, too, is an optional feature. The Operator and Mailing File (OMF) is created initially by entering the data about all known operators and addressees. From then on regular production is done monthly or bi-weekly and consists of data entry and updating the OMF; report production is on request only.

C. Optional Production

Regular production, as described above, is adequate for collection and maintenance of data and for monitoring compliance during the current reporting period, but state officials may wish to use the data they maintain for other purposes. For example, it may be necessary to identify all public water systems using a specific treatment method; to schedule classes for certified operators; to review all enforcement actions cases which are still pending, etc.

In order to accomodate such ad hoc production, MSIS provides a simple selection language. Requests for a retrieval of specific data are submitted to a "selection process" which performs the task of applying selection criteria to MSIS files, retrieving the requested data and displaying it as required. MSIS selection capabilities are not the same as a report generator because report formats are fixed; the user controls the data to be displayed rather than the exact format. This drawback is partially compensated by having a variety of report formats. States which employ large computer systems usually have one or more general purpose report generators installed (e.g. EASYTRIEVE, DYLACOR). By using such software they can easily obtain additional report formats.

A report selection process is designed for the following subsystems:

- Public Water Systems Inventory
- Water Quality Compliance
- Variances and Exemptions
- Enforcement Actions
- Operator and Mailing

It should be noted that although the process of scanning a file, selecting and sorting the required data and producing a report involved several steps the user is unaware of since it is done as one production job. The formats to be used in requesting special reports will be developed during detailed design.

The following example demonstrates how the selection process can be used:

A state may change the MCL for turbidity for an individual PWS from 1 TU to 5 TU. Assume that state officials want to review all PWSs for which an MCL of more than 1 TU is allowed, and that the drinking water control function is decentralized.

A request is submitted to produce the State Discretionary Data report (see section I.A) by selecting all PWSs that are allowed a modified MCL for turbidity of more than 1 TU. The data is to be sorted by regional office and PWS name.

Following the production, a list of PWSs is sent for review by each regional office.

II. System Overview

A. Introduction

The Model State Information System (MSIS) is a computer based information system designed to be used by the individual states and regional offices to meet the requirements of the "National Interim Primary Drinking Water Regulations" (December, 1974). These regulations were formulated by the U.S. Environmental Protection Agency under the authority of the Safe Drinking Water Act of 1974.

Using as a basis the Program Evaluation Requirements, Concepts and Plans for EPA Safe Drinking Water Program (Office of Water Supply, EPA, October 1975), American Management Systems, Inc. (AMS), performed a feasibility study and general systems design of the Model State Information System (June 15, 1976). Detail systems design, programming, testing, and documentation was carried out by SouthWestern Ohio Regional Computer Center (SWORCC).

MSIS is made up of five required subsystems and four optional subsystems. The five required subsystems are:

Public Water System Inventory Subsystem (PWSI)
Regulations Subsystem (REGS)
Water Quality Compliance Subsystem (WAQC)
Federal Reporting Subsystem (FEDR)
Standard Processing Subsystem (MSIS)

The four optional subsystems are:

Variances and Exemptions Subsystem (VAEX)
Enforcement Actions Subsystem (ENAC)
Sanitary Survey Subsystem (SRVY)
Operator and Mailing Subsystem (OPER)

B. General System Approach

The Model State Information System (MSIS) is designed to be standard enough that the individual states can use it on their various computer systems. At the same time, MSIS is flexible enough that the states may select segments of the system that fit their needs and may even easily modify the system to add to its functions.

Modularity of MSIS allows for flexibility. In order to give the States and regions the capability to fulfill their basic responsibilities to OWS, a minimum of five subsystems are required to do MSIS processing. They are the Public Water System Inventory Subsystem, the Water Quality Compliance Subsystem, the Regulations Subsystem, the Federal Reporting Subsystem, and the Standard Processing Subsystem. Four additional subsystems may be added, each at the discretion of the State or Region: the Variances and Exemptions Subsystem, the Sanitary Survey Subsystem, the Enforcement Actions Subsystem, and the Operator and Mailing Subsystem. In this way, the state may selectively add to or replace functions they currently have.

Within the subsystems, there is a built-in flexibility allowing the states to mold the system to better meet their individual needs. As an example, the Regulations Subsystem allows the states to input state regulations in addition to the required federal regulation. Flexibility is also given in report generation by allowing the state to select what information is to be contained on fixed format reports and in what order the report is produced. It must be emphasized, however, that any major changes may also require programming changes.

To contribute to the uniformity of MSIS, the following functions were standardized:

- File Maintenance
- Error Processing
- History Processing
- Report Generation
- Data Editing

1. File Maintenance

Adds:

The initial creation of a record on an MSIS file is accomplished with an ADD trasaction (code 00) which must contain all information necessary for processing by MSIS before it can be accepted.

Updates:

Existing data is modified by Update transactions. New data is edited and applied to the files field by field. An erroneous transaction field will not cause the entire transaction to be rejected. Instead, valid fields will be updated and only erroneous fields will need to be corrected and reentered. Since most update transactions refer to several data elements, the following approach is used:

a. If a data element field is blank, the data element on the file is not modified.

b. If the data element field contains a "$" in the leftmost position, the data element is reinitialized (existing data is replaced with blanks or zeros).

c. If transaction code "99" is used, the entire record is flagged as deleted. The only exception is in the Water Quality Compliance Subsystem, program WAQC010, where the delete transaction code is "01".

d. All other values can be used to replace the current value of the data element in the file provided that the new data is valid. Refer to the Data Element Dictionary (DED) to find the edit criteria for data elements.

2. Error Processing

Prior to actual processing, however, errors in processing options records must be handled in the individual programs. Errors created during actual processing of create and update modules in MSIS are handled by Standard Error Processing, a part of the Standard Processing Subsystem (MSIS). These errors created while updating or maintaining files, create the Standard Error File (SEF).

The SEF is processed by Standard Error Processing program (MSIS010) using the Error Message Table (EMT), to interpret the errors, and creating the Data Entry Error Report (Exhibit MSIS.313).

The Optional Error File (OEF) is an optional file which may be produced during Standard Error Processing so that the errors can be corrected by some text editing facility.

3. History Processing

In order to maintain an audit trail of the more important files of MSIS, two history processes are used. The Standard History Processing programs (MSIS.020,040,050), a part of the Standard Processing Subsystem, are used to record and make use of a history of all changes made to the Violations File (VIF), the Variances and Exemptions File (VEF), the Enforcement Actions File (EAF), and the Operator and Mailing File (OMF). These history records are maintained on the Standard History File (SHF).

The Public History File (PHF) is used to maintain a similar audit trail for the more complicated Public Water File (PWF) within the Public Water System Inventory Subsystem, (PWSI.070, 080, 090).

4. Report Generation

To permit the user to select and order records from files according to very flexible criteria, standard selection and sort methods are used throughout MSIS. Standard selection and sort processing options formats are used in all MSIS programs.

The selection process allows a maximum of thirty-five (35) data elements to be used as keys to determine if the data record qualifies to be selected. The user, therefore, can have an ample range for selecting records to be reported.

Additionally, the user has the option to have the records sorted in a meaningful sequence for the generation of a report. The user must keep in mind the length of the data elements to be used for sorting. A maximum of thirty (30) characters, accumulating all the lengths of the data elements, is allowed with no one length being greater than fifteen (15). Any data element with a length greater than fifteen will only use the first fifteen characters of the data element for sorting.

5. Data Editing

Some edit criteria is contained in the Code Value Table (CVT). The CVT contains acceptable data values in separate files for the eight subsystems of MSIS and one file of common data element values shared by two or more subsystems. (These common data elements are listed in Appendix A of the Data Element Dictionary). The CVT is used whenever possible to determine acceptable values.

C. Naming Conventions

1. File Name Abbreviations

Each file and table has associated with it a three letter abbreviation used in the full, programming name as an abbreviation for the file and a two letter mnemonic prefix used in the files' data element mnemonic names.

File Name	File ID	Mnemonic Prefix	Subsystem
Code Value Table	CVT	CV	MSIS
Compliance Status File	CSF	(none)	WAQC
Data Element Table	DET	DE	MSIS
Deviations File	DVF	(none)	FEDR
Enforcement Actions File	EAF	EA	ENAC
Error Message Table	EMT	EM	MSIS
Laboratory Table	LBT	LB	WAQC
Optional Error File	OEF	OE	MSIS
Operator and Mailing File	OMF	OM	OPER
Public History File	PHF	PH	PWSI
Periodic Sample File	PSF	PS	WAQC
Public Water File	PWF	PW	PWSI
Public Water Table	PWT	PT	PWSI
Regulations File	RGF	RG	REGS
Sample Analysis File	SAF	SA	WAQC
Standard Error File	SEF	SE	MSIS
Standard History File	SHF	SH	MSIS
Variances and Exemptions File	VEF	VE	VAEX
Violations File	VIF	VI	WAQC

2. COBOL Programming Names

The file and table data element names used in programming are assigned using the three letter file ID followed by a dash and a one (1) to twenty-six (26) character descriptive name. Example: PWF-PLANT-POPULATION-SERVED. (ANSI COBOL allows a maximum of thirty characters for a data name.)

3. Mnemonic Names

The Data Elements of some of the permanent files and tables have mnemonic names in addition to the COBOL programming names. The mnemonic name is formed using the two letter mnemonic prefix followed by a dash and a one (1) to seven (7) character abbreviation of the descriptive portion of the corresponding programming name. Example: PW-PL-POPL for PWF-PLANT-POPULATION-SERVED. The mnemonic names are used when filling in the SORT and SELECTION processing option forms, and also appear on the Standard Error Report.

4. Exhibits

Exhibit numbers are prefixed by the four letter subsystem prefix followed by:

A. 100-199 for input forms

B. 200-299 for record definitions

C. 300-399 for report layouts

D. 400-499 for turnaround documents

D. Files and Tables

The following are the permanent files and tables of MSIS. They are listed by the subsystem responsible for the files' creation.

1. Public Water System Inventory Subsystem (PWSI)

a. Public Water File (PWF), Exhibit PWSI.200, Data Element Catalogue Numbers 145 through 264, 701 and 702: The PWF is a variable length, sequential access file of detailed information about all Public Water Systems in the state.

b. Public Water Table (PWT), Exhibit PWSI.201, Data Element Catalogue Numbers 265 through 278, and 703: The PWT is a fixed length, direct access file of selected information from the PWF used primarily for supplying information on reports throughout MSIS.

c. Public History File (PHF), Exhibit PWSI.202, Data Element Catalogue Numbers 310 through 318: The PHF is a fixed length, sequential access history file of all modifications to the PWF used as an audit trail of the file.

2. Regulations Subsystem (REGS)

a. Regulations File (RGF), Exhibit 250 through 257, Data Element Catalogue Numbers 1 through 144: The RGF is a fixed length, sequential access file of all state and federal drinking water quality regulations.

3. Water Quality Compliance Subsystem (WAQC)

a. Periodic Sample File (PSF), Exhibit WAQC.252, Data Element Catalogue Numbers 399 through 429, 817 and 818, and 900 through 902: The PSF is fixed length, sequential access file of all water quality sample transactions.

b. Sample Analysis File (SAF), Exhibit WAQC.254, Data Element Catalogue Numbers 356 through 392, 807 through 816. The SAF is a fixed length, sequential access file containing a record for each chemical or radiological sample and a summary record of bacteriological and turbidity samples. The SAF is a summary of the PSF used to reduce the great numbers of sample records kept.

c. Violations File (VIF), Exhibit WAQC.255, Data Element Catalogue Numbers 326 through 355 and 800 through 806, and 819. The VIF is a fixed length, sequential access file of the violations to the drinking water regulations.

d. Laboratory Table (LBT), Exhibit WAQC.250, Data Element Catalogue Numbers 319 through 325 and 820: The LBT is a fixed length, direct access file of laboratories authorized to analyze water samples.

e. Compliance Status File (CSF), Exhibit WAQC.257, Data Element Catalogue Numbers 516 through 533. The CSF is a fixed length, sequential access file of information which deals with compliance determination.

4. Federal Reporting Subsystem (FEDR)

a. Deviations File (DVF), Exhibit FEDR.202, Data Element Catologue Numbers 492 through 511: The DVF is a fixed length, sequential access file of violations, variances, and exemptions. The DVF is created in FEDR for submission to EPA.

5. Standard Processing Subsystem (MSIS)

a. Code Value Table (CVT), Exhibit MSIS.206, Data Element Catalogue Numbers 279 through 284: The CVT is a fixed length, sequential access file of data element values used in editing in MSIS.

b. Data Element Table (DET), Exhibit MSIS.201, Data Element Catalogue Numbers 285 through 293: The DET is a fixed length, sequential access file of data element information used in MSIS.

c. Error Message Table (EMT), Exhibit MSIS.205, Data Element Catalogue Numbers 294 through 297: The EMT is a fixed length, sequential access file of errror codes and associated messages used in standard error processing.

d. Optional Error File (OEF), Exhibit MSIS.215, Data Element Catalogue Numbers 308 and 309: The OEF is a fixed length, sequential access file of errors created during MSIS processing used for correcting the errors using text editing facilities.

e. Standard Error File (SEF), Exhibit MSIS.207, Data Element Catalogue Numbers 298 through 300: The SEF is a fixed length, sequential access file of errors created during processing in MSIS.

f. Standard History File (SHF), Exhibit MSIS.202 Data Element Catalogue Numbers 301 through 307:

The SHF is a fixed length, sequential access file of changes made to the Violations File (VIF), the Enforcement Actions File (EAF), the Variances and Exemptions File (VEF), and the Operator and Mailing File (OMF).

6. Variances and Exemptions Subsystem (VAEX)

   a. Variances and Exemptions File (VEF), Exhibit VAEX.212, Data Element Catalogue Numbers 455 through 477: The VEF is a variable length, sequential access file of the variances and exemptions granted by the state to public water systems.

7. Enforcement Actions Subsystem (ENAC)

   a. Enforcement Actions File (EAF), Exhibit ENAC.202, Data Element Catalogue Numbers 430 through 454: The EAF is a variable length, sequential access file of enforcement actions being monitored by the state.

8. Operator and Mailing Subsystem (OPER)

   a. Operator and Mailing File (OMF), Exhibit OPER.200, Data Element Catalogue Numbers 478 through 491: The OMF is a variable length, sequential access file of mailing information and records of certified operators.

(Sanitary Survey Subsystem (SRVY) does not create any permanent files.)

III. Subsystem Descriptions

A. Public Water System Inventory Subsystem (PWSI)

1. General Description

The Public Water System Inventory Subsystem (PWSI) is central to and a mandatory subsystem of the Model State Information System (MSIS). This subsystem maintains descriptive data about Public Water Systems (PWS's) on a Public Water File (PWF). This file is also used by other subsystems. The principal function of the PWSI Subsystem is to create and maintain this file and to display its contents upon request.

The PWF is used in the following subsystems:

- Water Quality Compliance Subsystem (WAQC) uses the PWF to identify state defined regulation criteria for each specific PWS.
- Federal Reporting Subsystem (FEDR) uses the PWF to report on the individual PWS's which were modified in a specific reporting period.
- Sanitary Survey Subsystem (SRVY) uses the PWF to selectively weigh and list PWS's for survey purposes according to specific criteria.

In addition, some basic descriptive data is maintained in a direct access file, the Public Water Table (PWT), that is used as a verification aid and as a source of Public Water File data by the following subsystems: Enforcement Actions Subsystem, Variances and Exemptions Subsystem, and Operator and Mailing Subsystem. This table is built from the PWF.

3. PWSI Subsystem Overview

The overall design of the PWSI includes the following functions:

- conversion of the PWF from the National Inventory File
- data entry and updating
- selection of data for reporting from the Public Water File and Public History File
- condensed reporting
- state discretionary data reporting
- Public Water System production data reporting
- comprehensive reporting
- history file maintenance, purge and reporting
- initial creation of the PWF from the national PWS Inventory File
- creation of the PWT

The main features of the PWSI Subsystem are

- Inputs do not depend on automation of other optional subsystems
- A sequential file and a direct-access table
- Variable length record for each PWS dependant on the number of water sources
- Flexible reporting modules that allow the user to specify selection criteria and sort sequence, but within predetermined print formats
- Suitable for annual reporting to EPA

Inputs to the subsystem consist of source documents that are transcribed on special input forms and then keypunched. The regular process is to read the input transactions and edit and verify all verifiable data. Transactions without errors are used to update the PWF, and those in error appear on an error list produced to facilitate correction of errors. Periodically and upon request, the PWF can be used to list an inventory of Public Water Systems and other information for use by state officials.

The inputs to PWSI Subsystem emanate from such sources as:

- EPA National PWS Inventory File (an inital conversion process)
- Sanitary surveys scheduled or performed
- Permits for new PWS's
- Updates received from PWS operators
- Updates received from VAEX, if subsystem is used
- Updates received from WAQC

Except for data from the EPA National PWS Inventory File, all inputs must be transcribed on a single input form that may be used for all these transactions (See Exhibit PWSI.400-401).

Exhibit PWSI.400-401 contains the format for PWS status and entry. This form serves two purposes:

- As an input form for the creation of a new PWS record
- As a turnaround document on which a PWS status is printed and which can be used to make changes and corrections to the record.

B. Regulations Subsystem (REGS)

1. General Description

The Regulations Subsystem (REGS) is a mandatory subsystem whose purpose is to create the Regulations File (RGF). The RGF is a file of records containing the Federal and/or state regulations for contaminants monitored in drinking water. The RGF serves as a basis for determining whether water samples taken from a PWS distribution system are in compliance with chemical, radiological, bacteriological or turbidity State or Federal Regulations. Each record on the RGF pertains specifically to information necessary to define a State or Federal Regulation for one contaminant. In addition, Federal and State Regulation tables such as the fluoride temperature dependent maximum contaminant levels are included in the RGF.

Drinking water quality is determined by comparing the results of laboratory analysis with the requirements of the National Interim Primary Drinking Water Regulations as contained on the RGF. These regulations specify the number of samples required, analysis methods allowed, and contaminant levels permitted. In some instances Federal standards are modifiable by the States (for example, as in 141.27, using alternative analytical techniques). A State may also choose to enforce its own, more stringent standards, in which case, a Public Water System (PWS) may be in violation of the state's standards, but not of the federal standards.

The RGF is used by the Water Quality Compliance Subsystem (WAQC) for determining Maximum Contaminant Level (MCL) and Sampling Violations and for scheduling samples and subsequent analysis for a given PWS.

3. REGS Subsystem Overview

The Regulations Subsystem consists of only two modules (REGS010 and REGS020) whose functions are to accept input transactions to create the Regulations File (RGF) and list its contents.

The fundamental structure of the RGF follows the National Interim Primary Drinking Water Regulations. If a State defines its regulations differently, the file formats may not fit the structure of the State regulation and a special interface must be developed for that State. States may, however, add contaminants to the file so long as the basic structure of the record is not violated.

The input consists of cards keypunched from the Regulations Subsystem input forms (Exhibits REGS.101 to 108). The output comprises the Regulations Tables and Reports (Exhibit REGS.301 - 308). The process consists of reading and editing all input transactions, creating a new RGF and listing its contents.

Since the regulations are expected to be fairly static once established, the system does not provide individual record update capability. Each time a regulation is changed, data from the new set of keypunched cards entirely rebuilds the RGF. However, states that have access to sophisticated computerized text editors may wish to maintain the RGF through such existing procedures.

C. Water Quality Compliance Subsystem (WAQC)

1. General Description

The Water Quality Compliance Subsystem (WAQC) is a mandatory subsystem which is designed to monitor the quality of the drinking water supplied to the public. Two levels of PWS compliance with the Safe Drinking Water Act may be defined. The first, or primary level of compliance is achieved by using those treatment, storage, and distribution methods needed to supply safe drinking water. A secondary compliance level is achieved by monitoring the quality of the drinking water being supplied to the public. This is a more indirect level and, therefore, less desirable method of detecting problems. Primary compliance actions are designed to prevent problems before they arise; secondary compliance activities are designed to identify problems and correct them after they have arisen.

Primary compliance can be controlled by a state in two ways; by a permit program for new PWS or by periodic sanitary surveys. A permit program is essentially a sanitary engineering task. The PWSI Subsystem will be used to maintain most data elements related to facilities. The Sanitary Survey Subsystem is used to schedule inspections of PWS facilities and thus provides a second way of controlling basic compliance.

Secondary compliance is accomplished by monitoring the sampling and analysis of finished water. The WAQC is designed to provide the means for this monitoring process.

There are eight requirements in the National Interim Primary Drinking Water Regulations that a PWS could violate:

(1) Maximum Contaminant Level (MCL).

(2) Sampling requirements: number, frequency, and methodology;

(3) Check sampling;

(4) State notification;

(5) Public notification;

(6) Treatment techniques;

(7) Violation of compliance schedule under a variance or exemption;

(8) Record Keeping.

The main purpose of the WAQC is to identify violations of the first three of these regulatory requirements. In this way, the Water Quality Compliance Subsystem compliments the PWSI Subsystem and the Sanitary Survey (SRVY) Subsystem by providing data management for tracing non-compliance with the Safe Drinking Water Act.

Secondary compliance can be further classified as compliance with the National Interim Primary Drinking Water Regulations or compliance with the state's own standards. There is a need to identify both, and also to indicate if non-compliance is temporarily overruled by variances or exemptions. The WAQC Subsystem responds to this need by using the Regulations File (RGF) and the Public Water File (PWF).

3. WAQC Subsystem Overview

The WAQC contains programs to carry out the following functions:

- Data Entry and Updating
- Selection and Sorting
- Reporting
- Purging
- Summarizing
- Violation Identification
- Sample Scheduling

The main features of the Water Quality Compliance Subsystem are:

- Batch, sequential processing;
- Interaction with the other MSIS Subsystem;
- Flexible selection and reporting modules that allow the user to specify record selection and sort sequence, but within predetermined print formats;
- Identification of violations of sampling requirements and contaminanct levels.

Analysis result input transactions are entered via sample data input forms for bacteriological, turbidity, chemical, and radiological samples. Input transactions may also be used for creating, deleting, or updating files (Periodic Sample File, Sample Analysis File, Violations File, Laboratory Table)

The three basic transactions in the sample data, file updates, and file deletions -- are discussed below:

a. Sample Data

The system is designed to accept three types of samples described below -- bacteriological, turbidity, and chemical and radiological samples.

1. Bacteriological Samples

Bacteriological samples may be reported by each PWS on a monthly summary form (Exhibit WAQC.108 and 402) or as a list of samples (Exhibit WAQC.107 and 401). The state may use the Bacteriological Reporting Requirements Flag on the inventory record to indicate the reporting mode for each PWS. If the flag is not set, it is assumed that the PWS is reporting on a list.

2. Turbidity Samples

A PWS may report turbidity samples on a summary form (Exhibit WAQC.108 and 407) or a list of individual samples (Exhibit WAQC.107 and 405). The state may use the Turbidity Reporting Requirements Flag on the inventory record to indicate the reporting mode for each PWS. If the flag is not set, it is assumed that the PWS is reporting on a list.

3. Chemical and Radiological Samples

Results of samples for chemical and radiological analysis must be reported individually (Exhibits (WAQC.106, 400). This form contains only the contaminants included in the National Interim Primary Drinking Water Regulations; states may add more contaminants to its individual forms if desired.

b. File Updates

Violations which are not automatically identified by the Water Quality Compliance Subsystem must be reported using the Violation Reporting Form for additions or updates to the Violations file.

c. Deletion

The Sample Analysis File (SAF) and Violations File (VIF) use code 99 for deletions. The Periodic Sample File (PSF) is an exception; it uses code 01 for deletion. This exception was permitted because the PSF does not allow updating. The only way an update can be accomplished is to first delete (code 01) and, second, add a corrected version.

All analysis result input transactions are edited and posted to the Periodic Sample File (PSF) which is used to collect and store data during the compliance cycle. Every reporting period, some of the data from the PSF will be summarized and posted to the Sample Analysis File (SAF).

The PWF, VEF and the Violations File (VIF) are matched to create a Deviations File and modified Public Water File (PWF). These two files constitute most of the annual reporting requirements.

D. Federal Reporting Subsystem (FEDR)

1. General Description

The Federal Reporting Subsystem (FEDR) is a mandatory subsystem which produces two of the four files needed to meet requirements as specified in Section 142.15 of the Interim Primary Drinking Water Regulations that must be sent to EPA by states who assume primary enforcement responsibility. These include:

- Additions to the National Public Water System Inventory or any Public Water File record which was modified in the past year.
- All Federal violations of the primary drinking water regulations;
- All variances or exemptions being considered or granted by the state and the status of each of the variances and exemptions.

The purpose of the FEDR Subsystem is to retrieve data elements from the state's files, and if necessary, reformat them, and create two files for reporting to EPA. There are two modules FEDR010 and 020.

3. FEDR Subsystem Overview

The features of the subsystem are:

- Batch processing of the Public Water File, Variance and Exemption File, and the Violations File which are necessary for periodic reporting to EPA.
- Output is in the format required by EPA for reporting

One of the potential benefits from implementing the subsystem is that states need not perform any special action for the annual report to EPA. Execution of the Federal Reporting Subsystem will automatically produce a Public Water File of all new or modified Public Water Systems and a file of all Federal Violations and Variance and Exemptions, unless the Variances and Exemptions Subsystem is not implemented, in which case their reporting must be done manually. This will save states using the Model State Information System the expense of preparing special summaries or input forms for EPA. And EPA will enjoy the benefit of standard formatted input files and more timely, accurate, and formatted input to its own data management system.

The process in preparing files and reports to submit to EPA is composed of the following steps:

a. Update the Violations File (VIF) with all current Violations data (module WAQC120) and produce the Compliance Summary Report (module WAQC125), selecting only those records which violate the Federal Interim Primary Drinking Water Regulations.

b* Update the Variances and Exemptions File (VEF) with all current Variances and Exemptions data (module VAEX010) and produce the Variances and Exemptions Condensed Report (modules VAEX040, VAEX041).

c. Run the Federal Reporting jobstream which will:

   1. Build the modified Public Water File (PWF) (module FEDR010).

   2. Build the Deviations File (DVF) (module FEDR020).

d. Run the following jobs which will complete the Federal Reporting Process:

   1. Produce the Public Water System Condensed Report from the modified PWF (modules PWSI020,PWSI030).

   2* Copy the Enforcement Actions File (EAF).

   3* Produce the Enforcement Actions Case History Report (modules ENAC020, ENAC030).

The files that are required for reporting are then ready, together with reports of their contents. Copies of the reports which were produced in the above steps should be made available for public inspection as required by 142,15(d) of the regulations.

*Note: These steps are bypassed if the subsystem referred to is not installed.

E. Standard Processing Subsystem (MSIS)

1. General Description

The Standard Processing Subsystem (MSIS) is a mandatory utility subsystem. It provides all of the other subsystems except Federal Reporting (FEDR) and Sanitary Survey (SRYV) Subsystems, with edit criteria and error processing. It provides a history file for Enforcement Actions (ENAC), Operator and Mailing (OPER), Variances and Exemptions (VAEX), and Violations File (VIF) from Water Quality Compliance (WAQC).

3. MSIS Subsystem Overview

The major functions of the MSIS subsystem are:

- Code Value Table (CVT), Data Element Table (DET), and Error Message Table (EMT) Creation
- Error handling
- History maintenance, purge, and reporting
- History record selection and reporting

The main features of the subsystem are:

- Sequential files and tables
- Batch processing
- Flexible record selection and reporting modules

The Code Value Table (CVT), Data Element Table (DET), and Error Message Table (EMT) are created in module MSIS030 from input forms Exhibits MSIS.102, 103, 104.

The Standard Error File (SEF) is created by all subsystems except the Sanitary Survey Subsystem (SRVY) and Federal Reporting Subsystem (FEDR) and processed by the MSIS Subsystem.

The Standard History File (SHF) is created by the Water Quality Compliance Subsystem (WAQC), and the Variances and Exemptions Subsystem (VAEX), Enforcement Actions Subsystem (ENAC), and Operator and Mailing Subsystem (OPER) if used by the state or region, and is then processed by the MSIS Subsystem.

F. Variances and Exemptions Subsystem (VAEX)

1. General Description

The purpose of this optional subsystem is to provide the state or region with a method for collection, maintenance and processing of data related to the process of granting variances or exemptions from State or Federal Regulations. The variances and exemptions are granted by states who have primary enforcement responsibility. For States that have not qualified for primary enforcement responsibility, the EPA region is authorized to grant variances and exemptions.

Variances and exemptions may not be granted if to do so would result in an "unreasonable risk to health". EPA has indicated that this is to be interpreted to mean that no variances or exemptions from bacteriological Maximum Contaminant Levels (MCL's) should be permitted. Variances and exemptions, therefore, will probably be permitted only from the chemical contaminant levels.

Variances and exemptions both have essentially the same result. Both effectively exempt a Public Water System from one or more requirements of the regulations. The difference lies in the circumstances under which they may be granted and the length of time allowed for compliance.

a. Variances

1. A variance from a maximum contaminant limit may be granted if a PWS is unable to comply because it is unable to make its raw water source safe for technological reasons. For example, many water systems in the southern part of Virginia draw their water from sources containing a naturally high concentration of fluoride. These systems will probably have to find an alternative source of water either by building a new treatment plant at another location or purchasing their water from a safe supplier. Until they are able to locate an alternative source and build the necessary treatment facilities or locate a safe supplier, they will need a variance from the fluoride contaminant limit.

2. A variance from the required treatment technique may be granted if a PWS can demonstrate that the treatment is not required because of the high quality of its raw water. In this case, the raw water is naturally free from a particular type of contaminant or contains low enough levels that it is unnecessary to treat it for that particular type of contaminant.

The first type of variance will be terminated when the system comes into compliance with the standard. The second type may be terminated at any time upon a finding that the nature of the raw water sources has changed to the extent that treatment is required. In effect, both types of variances will be granted for indefinite time periods with no legislated termination date.

b. Exemptions

Exemptions may be granted to PWS's that are unable to comply for compelling reasons, mainly economic ones. In other words, an exemption is designed to solve the problem of systems that cannot afford to apply available treatment technology rather than the problem of systems that cannot make their water safe with even the best available treatment technology. Exemptions address an economic problem, variances, a technical problem. Unlike variances, moreover, exemptions cannot be granted for indefinite time periods. The act itself states that compliance must occur by certain dates.

Exemptions are clearly aimed at the economic problems of smaller systems. The states or regions can use exemptions to give smaller systems additional time to comply with the regulations, but the Act contains specific cutoff dates by which these systems must be in compliance regardless of the cost.

If a variance or exemption is granted, the state or EPA region must prescribe a schedule for compliance and interim control measures within one year of the date it is granted. The state or region must monitor actual progress against this schedule in the same way that it has to monitor compliance with the main body of drinking water regulations.

3. VAEX Subsystem Overview

The VAEX subsystem must maintain variances and exemption information for three purposes. First, this type of information is required by the Federal Reporting Subsystem (FEDR) for reporting to EPA. Second, information is required for monitoring progress against compliance schedules specified in particular variances and exemptions for particular Public Water Systems. Last, any variance or exemption data needed for determining compliance will be generated by this subsystem and transmitted to the Public Water File.

The major functions of VAEX are:

- Data Entry and Updating
- Selection and Reporting
- Providing data to the Public Water System Inventory Subsystem.

The main features of the VAEX subsystem are:

- Sequential, variable length file;
- Batch processing;
- Flexibility in reporting with respect to selection, sorting, summarizing;
- Subsystem is optional and can be used if needed.

The source of transactions to create and maintain the Variances and Exemptions File (VEF) is the administrative unit responsible for the granting and monitoring of variances and exemptions.

All variances and exemptions on the VEF are identified by a sequential identification number. Accordingly, transactions refer to a VEF record by that number in positions 1 to 5 of the record. There are four types of transactions: addition of a new VEF record, milestone creations, changes to data elements in an existing record, and deletion of an existing record. All transactions are identified by a two-digit transaction code in positions 6 to 7 of the record. The transaction key, positions 1-7, is a combination of VAEX-ID and transaction code. Reference input forms layout in Exhibit VAEX.100, 101, 107.

G. Enforcement Actions Subsystem (ENAC)

1. General Description

The purpose of this optional subsystem is to provide the state or region with a method for collection, maintenance, and processing of data related to actions performed in connection with enforcing the state's own regulations (or the Federal Regulations) under the Safe Drinking Water Act. The data can then be used for evaluating the effectiveness of different types of enforcement actions. Reporting to EPA of enforcement actions, as required by section 142.15 of the regulations, can also be done automatically using the subsystem by submitting to EPA the reports of the entire Enforcement Actions File (EAF).

3. ENAC Subsystem Overview

The major functions of ENAC are:

- Data entry and updating
- Selection and reporting

The subsystem has the following features:

- Flexibility in preparing reports with respect to selection criteria and sorting;
- Subsystem is optional within MSIS;
- Batch processing using sequential files.

The source of transactions to create and maintain records in the Enforcement Actions File (EAF) is the administrative unit responsible for enforcing the drinking water regulations by formal actions.

A five-digit sequential number is used to identify an Enforcement Action record. This number in positions 1 to 5 of a transaction and transaction code in positions 6 and 7 constitute the transaction key.

H. Sanitary Survey Subsystem (SRVY)

1. General Description

The Sanitary Survey Subsystem (SRVY) is an optional subsystem designed to satisfy Section 142.10 (B)(2) of the Drinking Water Standards Implementation Regulations which requires states that assume enforcement responsibility to have "A systematic program for conducting sanitary survey compliance..."

A survey of 24 states shows that many states do not have enough manpower to survey as they would like. The addition of non-community Public Water Systems (PWS's) to those already under regulation, will increase the need for a systematic method of scheduling sanitary surveys. The Sanitary Survey Subsystem is designed to provide this systematic method.

The method is based on assigning different weight to five parameters: PWS type size of population served, the type of source water and Public Water System has, compliance history, and period elapsed since last survey. State officials can change the relative weights until a satisfactory formula is reached.

3. System Overview

The major functions of SRVY are:

- Scheduling
- Reporting

The features of the subsystem are:

- Simple, batch processing;
- Generation of Public Water File form designed as a turnaround document for computer input processing;
- Interaction with the PWSI Subsystem.

SRVY uses the Public Water File (PWF) and Violations File (VIF) to identify systems who are in violation and those who fit the prescribed conditions for selection.

I. Operator and Mailing Subsystem (OPER)

1. General Description

The Operator and Mailing Subsystem (OPER) is an optional subsystem designed for two purposes: first, to provide management with data concerning certified operators, and second, to provide the state with the capability to manage a mailing distribution list for mailing material to local governments, cities, consulting engineers, etc. Since the mailing list and operator data requirements are similar, these two functions are combined in a single subsystem.

3. OPER Subsystem Overview

The major functions of OPER are:

- Data Entry and Update
- Selection and Reporting
- Label Printing

The subsystem features:

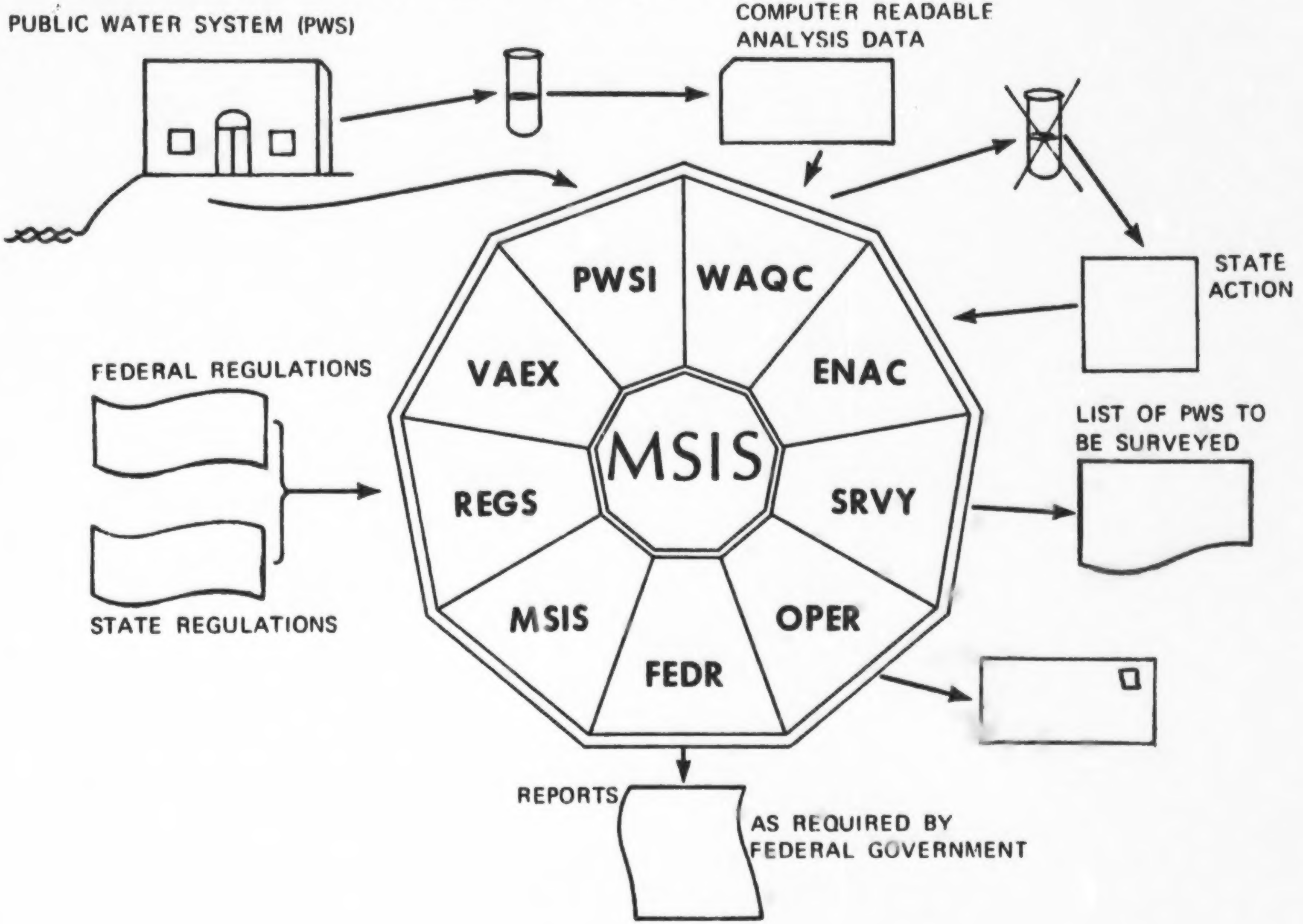
- Off-line batch processing
- Sequential processing of a variable length
- Flexibility in reporting or printing labels with respect to selection and sorting.

Transactions to maintain the Operator and Mailing File (OMF) are of three types: add a new record, change data elements in an existing record, and deletion of a record. Records are identified by a five-digit sequential number and an addressee type code.

Addressee type '0' is reserved for operators. Other addressee types are left to be defined by each stat according to its needs.

Because an operator record contains more information than other addressee type records, there are two different input forms for the two types (see Exhibits OPER.107 and 108). The difference between the two is that transaction '03' applies only to operator records.

Model State Information System



PUBLIC WATER SYSTEM (PWS)
COMPUTER READABLE ANALYSIS DATA
STATE ACTION
FEDERAL REGULATIONS
STATE REGULATIONS
PWSI
WAQC
VAEX
ENAC
MSIS
REGS
SRVY
MSIS
OPER
FEDR
LIST OF PWS TO BE SURVEYED
REPORTS
AS REQUIRED BY FEDERAL GOVERNMENT